

Approved by
Academic Council of
Igor Sikorsky Kyiv Polytechnic Institute
Protocol № 4 since 04.02.2018

ELECTRIC MACHINES AND APPARATUS

EDUCATIONAL AND PROFESSIONAL PROGRAM of the second (master's) level of higher education

Specialty 141 Electric power, electrical engineering and electromechanics

Field of knowledge 14 Electrical engineering

Master's degree in electrical power, electrical engineering and electromechanics

Changes and additions agreed with SMCU 141
Protocol № 3 since 27.05.2020
The educational program with changes and
additions is put into effect
since 2020/2021 academic year
Order № 1/231 since 08.07.2020

The educational and professional program was developed by the project team

Project team leader

Yuriy Vaskovsky, Doctor of Technical Sciences, Professor

Members of the project team

Mykola Reutskiy, PhD, Associate Professor

Sergiy Tsivinskiy, PhD, Associate Professor

The Department of Electromechanics is responsible for the training of applicants for higher education according to the educational and professional program

Agreed:

The first edition of the educational program was approved by the Methodical Commission of the Igor Sikorsky Kyiv Polytechnic Institute (Protocol № 7 since 29.03.2018)

Changes and additions of the educational program was approved by the Scientific and Methodical Commission of the University for Specialty 141 Electric power, electrical engineering and electromechanics

Protocol № 3 since 27.05.2020

The Head of SMCU 141

Oleksandr Yandulsky

Taken into account

Modernization of the educational program is performed on the basis of the approved standard of higher education for Specialty 141 Electric power, electrical engineering and electromechanics (Order of MES № 876 since 20.06.2019)

Proposals of stakeholders in the formation of the EPP are taken into account and confirmed by cooperation agreements between the KPI and “Kvant” Research Institute, G. Petrovskiy Kyiv Automatics Plant, Antonov subsidiary company, Kyiv metro, private joint-stock company “Kyivoblenergo”, private joint-stock company “Kyiv electric car repair plant”, “Construction machinery” subsidiary company, Cascade of Kyiv hydroelectric power plants and hydroaccumulating power plants, Kyiv TPP “Kyivteploenerho”, private joint-stock company “Ventilation systems”, “Diada group” LLC, private enterprise “Scientific and technological center “Reducer”, research and production center “Vertical”, Kremenchug hydroelectric power station.

The requirements of existing and approved standards of Ukraine, requirements for staffing and technological support in accordance with the License Terms approved by the Resolution of the Cabinet of Ministers of Ukraine since 30.12.2015 № 1187, the wishes of students, the results of discussions at meetings of the Electromechanics Department.

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1. PROFILE OF THE EDUCATIONAL PROGRAM

Specialty 141– Electric power, electrical engineering and electromechanics

for the educational and professional program “Electric machines and apparatus”

1 – General information	
Full title of HEI and institute / faculty	National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, Electrical Power engineering and automation departament
Degree of higher education and title of qualification in the original language	Degree – магістр (master) Qualification – магістр з електроенергетики, електротехніки та електромеханіки (Master in electrical power, electrical engineering and electromechanics)
Official title of the educational program	ELECTRIC MACHINES AND APPARATUS
Type of diploma and scope of educational program	Master's degree, single, 90 credits, term of study 1 years 4 months
Availability of accreditation	Accreditation Certificate of ND № 1192558 dated September 25, 2017, issued by the Ministry of Education and Science of Ukraine, valid until July 1, 2023
Cycle / level of HE	NQF of Ukraine – level 8
Precondition	Availability of bachelor's degree
Language (s) of teaching	Ukrainian/English
Valid date of the educational program	Until next accreditation
Internet address of the permanent placement of the educational program	http://em.fea.kpi.ua/images/doc_stud/opp_m_emsemetsk.pdf http://osvita.kpi.ua/index.php/op
2 – The purpose of the educational program	
Training of a specialist capable of solving complex problems and problems in the field of electrical power, electrical engineering and electromechanics industries and to carry out innovative professional activities	

3 – Characteristics of the educational program	
Subject area	Specialty 141 Electric power, electrical engineering and electromechanics Field of knowledge 14 Electrical engineering Objects of study and activity: enterprises of the electric power complex, electrotechnical and electromechanical services of organizations, production, transmission, distribution and conversion of electric energy at electric power stations, in electric networks and systems, electrotechnical equipment, electromechanical and switching equipment, electromechanical and electrotechnical complexes and systems. The purpose of study is the training of specialists capable of designing, designing, operating, providing a safety culture, carrying out installation, commissioning and repair, creating new equipment, and implementing the latest technologies, conducting research and teaching. Theoretical content of the subject area: fundamental knowledge of the theory of electrical engineering and electromechanics, modeling and optimization of electric power, electrotechnical and electromechanical systems and complexes, their use for innovations and researches of operating modes of power stations, networks and systems, electric machines and electric drives. Methods, techniques and technologies: methods and means of research of processes in equipment in electric power and electromechanical systems and complexes, automated design, design and production. Tools and equipment: tools, devices, systems, technologies of design, engineering and production.
Orientation of the educational program	Educational and professional
The main focus of the educational program and specialization	Special education in the field of power engineering, electrical engineering and electromechanics Keywords: electromechanical systems, automated electric drives, electric machines, electrical devices, electrotechnical devices, electrotechnological complexes
Features of the program	Involvement of specialists from other educational institutions in teaching disciplines. Conducting internships for students in the industry. The possibility of teaching certain courses in English.
4 – Suitability of graduates for employment and further education	
Suitability for employment	Specialists are able to hold positions, the qualification requirements of which include a master's degree in electrical engineering, electrical engineering and electromechanics, in business entities engaged in the following types of economic activity (according to the classifier of economic activities types-2010): 33.14 Repair and maintenance of electrical equipment 33.20 installation and assembly of machinery and equipment 35.11 Electricity generation 35.12 Transmission of electricity 35.13 Distribution of electricity

	35.14 Trade in electricity 42.22 Construction of electricity and telecommunications facilities 43.21 Electrical work 71.12 Activities in the field of engineering, geology and geodesy, providing technical consulting services in these areas 71.20 Technical tests and research 72.19 Research and experimental development on other natural and technical sciences 74.90 Other professional, scientific and technical activities 85.41 Vocational education at the level of higher vocational education 85.42 Higher education 85.60 Support activities for education According to the classifier of professions DK 003: 2010 specialists can perform the following types of professional work: 2143.2 Engineer for operation of emergency automation 2143.2 Electrification engineer of an agricultural enterprise 2143.2 Engineer of the conversion complex 2143.2 Electrical engineer in the energy sector 2143.2 Power Engineer 2143.2 Structural Engineer (Electrical Engineering) 2143.2 Senior electrician-captain 2143.2 Senior electrician-commander 2144.2 Engineer for high-voltage tests and measurements of power equipment 2145.2 Engineer for mechanization and automation of production processes 2145.2 Engineer for mechanization and automation of labor-intensive processes 2149.2 Mechanized development design engineer 2149.2 Mining electrical engineer 2149.2 Design engineer 2149.2 Engineer-designer of machines and equipment of agricultural production Professional certification is possible
Further education	Graduates have the right to continue their studies at the third (educational and scientific) level of higher education
5 – Teaching and evaluation	
Teaching and learning	Lectures, practical and seminar classes, computer workshops and laboratory work, course projects and works, technology of blended learning, practices and excursions, master's dissertation.
Evaluation	Rating system, oral and written exams, testing.
6 – Program competencies	
Integral competence	Ability to solve complex problems and problems of professional activity in the field of electrical engineering and electromechanics, which involves research of electrical and electromechanical complexes and the implementation of innovations.

General competencies (3K)	
3K 1	Ability to abstract thinking, analysis and synthesis of electromechanical complexes and electric machines
3K 2	Ability to search, process and analyze information from various sources
3K 3	Ability to use information and communication technologies
3K 4	Ability to apply knowledge in practical situations with electromechanical complexes and electric machines
3K 5	Ability to use a foreign language to carry out scientific and technical activities
3K 6	Ability to make informed decisions about problems with electromechanical complexes and electric machines
3K 7	Ability to learn and master modern knowledge
3K 8	Ability to identify and assess risks
3K 9	Ability to work independently and in a team
3K 10	Ability to identify feedback and adjust your actions based on them
Professional competencies of the specialty (ΦK)	
ΦK 1	Ability to apply the acquired theoretical knowledge, scientific and technical methods to solve scientific and technical problems and problems of power engineering, electrical engineering and electromechanics
ΦK 2	Ability to apply existing and develop new methods, techniques, technologies and procedures to solve engineering problems of power engineering, electrical engineering and electromechanics
ΦK 3	Ability to plan, organize and conduct research in the field of power engineering, electrical engineering and electromechanics
ΦK 4	Ability to develop and implement measures to improve the reliability, efficiency and safety in the design and operation of equipment and facilities of electricity, electrical engineering and electromechanics
ΦK 5	Ability to analyze technical and economic indicators and examination of design decisions in the field of power engineering, electrical engineering and electromechanics
ΦK 6	The ability to think modernly on the basis of the concept of sustainable development of society
ΦK 7	Ability to identify intellectual property rights
ΦK 8	Ability to research and identify problems and identify constraints, including those related to nature protection, sustainable development, health and safety, and risk assessments in electricity, electrical engineering, and electromechanics
ΦK 9	Ability to understand and take into account social, environmental, ethical, economic and commercial considerations that affect the implementation of technical solutions in power engineering, electrical engineering and electromechanics
ΦK 10	Ability to evaluate indicators of reliability and efficiency of operation of electric power, electrotechnical and electromechanical objects and systems

ΦK 11	Ability to develop plans and projects to ensure the achievement of the goal taking into account all aspects of the problem to be solved, including the production, operation, maintenance and disposal of equipment for power, electrical and electromechanical systems
ΦK 12	Ability to demonstrate awareness and ability to use regulations, norms, rules and standards in power engineering, electrical engineering and electromechanics
ΦK 13	Ability to use methods of valuation of intellectual property for their further commercialization, including for the sale of licenses and technology transfer
ΦK 14	Ability to publish the results of their research in scientific journals
ΦK 15	Ability to identify, obtain and place the necessary data, plan and conduct analytical and experimental research and modeling of electrical machines and devices, critically evaluate data and draw conclusions
ΦK 16	Ability to model and study with the help of modern software and hardware electromagnetic fields of electric machines and devices
ΦK 17	Ability to effectively use new technologies in the process of modernization and reconstruction of electrical equipment, electrical machines and devices, electric transport, electrical devices, systems and complexes
ΦK 18	Ability to develop plans and projects to ensure the achievement of the goal taking into account all aspects of the problem to be solved, including the production, operation, maintenance and disposal of equipment for power, electrical and electromechanical systems
ΦK19	Ability to develop physical and mathematical models of the studied machines, drives, systems, processes, phenomena and objects in the professional sphere, to develop methods and organize experiments with the analysis of results
7 – Program learning outcomes (ΠΡ)	
ΠΡ01	To know the basic types of intellectual property rights and methods of their protection, methodological and legislative bases of creation of intellectual property objects
ΠΡ02	To know the main provisions of regulatory documents governing innovation in Ukraine
ΠΡ03	To know the list of major open international banks of electronic resources to support educational, research and innovation activities
ΠΡ04	To know the basic principles of sustainable development of society, taking into account the social, technological, economic and environmental aspects of human activity
ΠΡ05	To know a foreign language at a level that provides free discussion with foreign scientists on current scientific and technical problems of power engineering, electrical engineering and electromechanics and the opportunity to speak at foreign conferences and symposia
ΠΡ06	To know the current standards, regulations and rules according to which Ukraine operates in the field of electricity, electrical engineering and electromechanics

ПР07	To know the rules of safe operation of electrical, electrical and electromechanical equipment
ПР08	To Know the provisions of the Energy Strategy of Ukraine and the principles of energy security
ПР09	To Know the effective methods and approaches aimed at improving the energy efficiency and reliability of electrical, electrical and electromechanical equipment and related complexes and systems
ПР10	To Know the provisions of the latest approaches and modern methods of research in the field of power engineering, electrical engineering and electromechanics
ПР11	To Know modern methods of mathematical modeling of objects and processes in electrical, electrical and electromechanical systems
ПР12	To Know modern software systems designed to create computer models of objects and in-depth study of processes in electrical, electrical and electromechanical systems
ПР13	To Know the theory of large systems, systems analysis and mathematical methods used to solve optimization problems in the field of power systems
ПР14	To Know the approaches to the optimal planning and conduct of experiments, the method of processing and evaluating the results of experimental research using modern information technology, current standards and requirements for the preparation of reports on research work
ПР15	To Know the composition and sequence of development of innovative projects
ПР16	To Know modern techniques, algorithms and software for calculation and design of electrical machines and devices
ПР17	To Know the design features, technical characteristics, principles of operation and modes of operation of electromechanical devices, electrical machines and devices, including powerful turbo and hydro generators
ПР18	To Know modern methods of mathematical modeling of electrical machines and devices, electromechanical energy converters, electromechanical complexes
ПР19	To Know modern methods of experimental research of electric machines and devices, electromechanical energy converters, electromechanical complexes
ПР20	To Find options to increase energy efficiency and reliability of electrical, electrical and electromechanical equipment and related complexes and systems
ПР21	To reproduce processes in electric power, electrotechnical and electromechanical systems at their computer modeling
ПР22	To Reconstruct existing electrical networks, stations and substations, electrical and electromechanical complexes and systems in order to increase their reliability, operational efficiency and resource life
ПР23	To Take into account the legal and economic aspects of research and innovation

ΠΡ24	To Present research materials at international scientific conferences and seminars on current issues in the field of power engineering, electrical engineering and electromechanics
ΠΡ25	To substantiate the choice of direction and methods of scientific research taking into account modern problems in the field of electric power, electrical engineering and electromechanics
ΠΡ26	To Plan and implement research and innovative projects in the field of power engineering, electrical engineering and electromechanics
ΠΡ27	To Combine different forms of research and practical activities in order to bridge the gap between theory and practice, scientific achievements and their practical implementation
ΠΡ28	To Fluently communicate orally and in writing in state and foreign languages on modern scientific and technical problems of power engineering, electrical engineering and electromechanics
ΠΡ29	To Identify problems and identify constraints related to environmental, sustainable development, health and safety and risk assessments in the fields of electricity, electrical engineering and electromechanics
ΠΡ30	To Identify the main factors and technical problems that may hinder the introduction of modern control methods for power, electrical and electromechanical systems
ΠΡ31	To Identify the problems facing society and which can be solved by using and adhering to the principles of sustainable development of society
ΠΡ32	To Solve classic, complex and unpredictable problems in the fields of power engineering, electrical engineering and electromechanics with the use of modern and innovative approaches to their solution
ΠΡ33	To Practical use of models and methods of interdisciplinary synthesis of complex technical systems with electromechanical energy converters
ΠΡ34	To Monitor and diagnose electrical and electromechanical equipment and facilities, establish the main causes of failure during their operation
ΠΡ35	To Investigate physical phenomena and processes in electrical machines and devices, electromechanical energy converters, electromechanical complexes
ΠΡ36	To Identify problems and identify constraints related to environmental, sustainable development, health and safety and risk assessments in the fields of electricity, electrical engineering and electromechanics

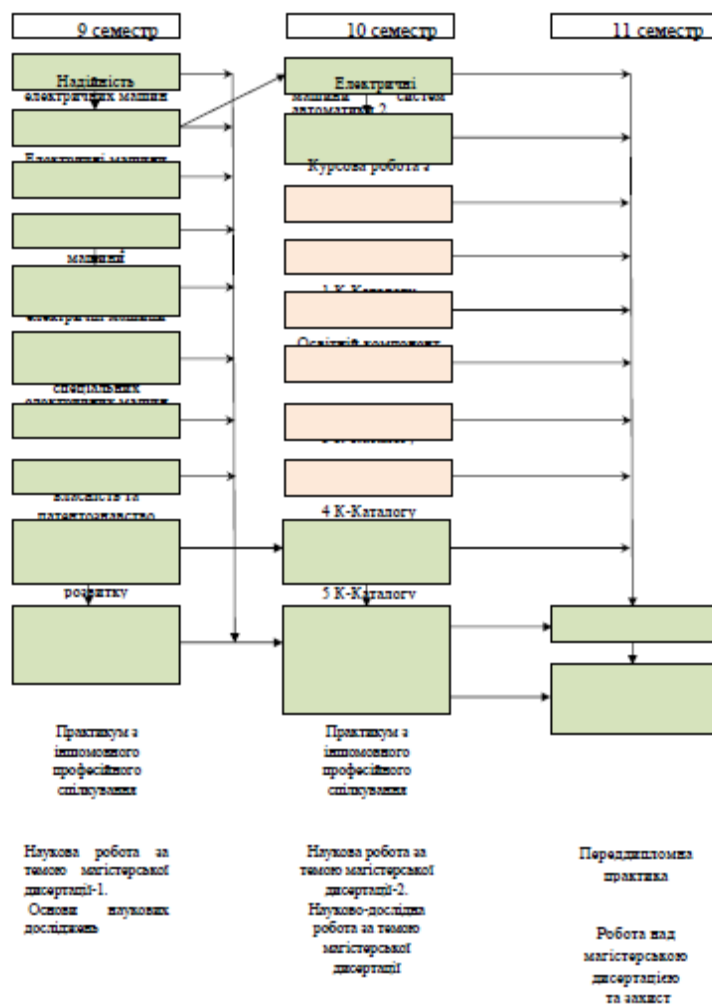
ПР37	To substantiate the choice of direction and methods of scientific research taking into account modern problems in the field of electric power, electrical engineering and electromechanics
8 – Resource support for program implementation	
Staffing	In accordance with the personnel requirements for ensuring the implementation of educational activities for the relevant level of HE (Annex 2 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine since 30.12.2015 № 1187
Material and technical support	In accordance with the technological requirements for material and technical support of educational activities of the appropriate level of HE (Annex 4 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine since 30.12.2015 № 1187
Informational, educational and methodical support	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 License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine since 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, on double graduation, on long-term international projects that include inclusive student education, 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, Minc Nancy, Nancy, France (Universite de Lorraine Ecole Nationale Supérieur 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 Giessen, Germany (Technische Hochschule Mittelhessen)
Teaching foreign applicants for higher education	Teaching in English

2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code	Components of the educational program (academic disciplines, practices, qualification work)	Number of credits	Form of final control
1	2	3	4
Normative EP components			
General training cycle			
30 1	Intellectual property and patent science	3	Test

1	2	3	4
30 2	Fundamentals of sustainable development of society	2	Test
30 3	Workshop on foreign language professional communication	3	Test
30 4	Startup project management	3	Test
Cycle of professional training			
ПО 1	Reliability of electric machines	6	Exam
ПО 2	Traction electric machines	4	Exam
ПО 3	Special electric machines	4	Exam
ПО 4	Course work with Special electric machines	1	Test
ПО 5	Electric machines of automation systems	6,5	Exam
ПО 6	Course work with Electric machines automation systems	1	Test
ПО 7	Scientific work on the topic of master's dissertation	4	Test
ПО 8	Pre-diploma practice	14	Test
ПО 9	Diploma project	16	Defence
Elective EP components			
Cycle of professional training			
ПВ 1	Educational component 1 K- Catalogue	6	Exam
ПВ 2	Educational component 2 K- Catalogue	3,5	Test
ПВ 3	Educational component 3 K- Catalogue	3	Test
ПВ 4	Educational component 4 K- Catalogue	4	Exam
ПВ 5	Educational component 5 K- Catalogue	3	Test
ПВ 6	Educational component 6 K- Catalogue	3	Test
Total amount of normative components :		67,5	
Total amount of elective components :		22,5	
The amount of educational components that ensure the acquisition of competencies defined by the HES		90	
TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM		90	

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



4. FORM OF FINAL CERTIFICATION OF APPLICANTS FOR HIGHER EDUCATION

Graduation certification of applicants for higher education in the educational program "Electric Machines and Apparatus" specialty 141 "Electric power, Electrical Engineering and Electromechanics" is conducted in the form of defense of the qualification work (master's dissertation) and ends with the issuance of a standard document on awarding a Master's degree in electrical power, electrical engineering and electromechanics.

Graduation certification is carried out openly and publicly.

Qualification work is checked for the absence of academic plagiarism, fabrication and falsification and after the defense is placed in the repository of the Igor Sikorsky KPI NTL for free access.

5. MATRIX OF CORRESPONDENCE OF PROGRAM COMPETENCES TO COMPONENTS EDUCATIONAL PROGRAM

		3O 1	3O 2	3O 3	3O 4	ΠO 1	ΠO 2	ΠO 3	ΠO 4	ΠO 5	ΠO 6	ΠO 7	ΠO 8	ΠO 9	ΠB 1	ΠB 2	ΠB 3	ΠB 4	ΠB 5	ΠB 6
3 K	1	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+		
3 K	2	+	+	+	+	+		+	+	+	+	+	+	+		+		+		+
3 K	3	+	+	+	+			+	+	+	+	+	+	+				+		
3 K	4	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3 K	5	+		+				+	+			+		+						
3 K	6	+			+	+	+					+	+	+	+	+	+	+		+
3 K	7	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+		
3 K	8				+	+		+	+	+	+	+	+	+	+	+				+
3 K	9		+									+	+	+						
3 K	10	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Φ K	1	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Φ K	2	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Φ K	3	+		+	+	+		+	+	+	+	+	+	+	+	+	+	+		+
Φ K	4		+		+	+	+	+	+			+	+	+	+	+	+	+		+
Φ K	5		+		+		+			+	+	+	+	+	+					
Φ K	6		+									+		+						
Φ K	7	+		+				+	+	+	+	+		+						
Φ K	8	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+		+
Φ K	9	+	+		+	+	+					+		+	+					
Φ K	10		+		+			+	+	+	+	+	+	+	+	+	+		+	
Φ K	11	+	+		+	+	+					+	+	+	+	+	+	+		+
Φ K	12	+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	+	+
Φ K	13	+	+			+	+			+	+	+	+	+	+		+			+
Φ K	14	+						+	+	+	+	+		+						
Φ K	15	+		+		+	+	+	+	+	+	+	+	+						
Φ K	16	+				+	+					+	+	+			+		+	
Φ K	17						+	+	+	+	+	+	+	+				+		
Φ K	18						+	+	+	+	+	+	+	+	+					
Φ K	19					+	+	+	+	+	+	+	+	+						

6. MATRIX FOR PROVIDING RELEVANT SOFTWARE LEARNING OUTCOMES

	3O 1	3O 2	3O 3	3O 4	ПО 1	ПО 2	ПО 3	ПО 4	ПО 5	ПО 6	ПО 7	ПО 8	ПО 9	ГБ 1	ГБ 2	ГБ 3	ГБ 4	ГБ 5	ГБ 6
ИП 1	+	+	+	+			+		+										
ИП 2	+	+	+	+			+		+										
ИП 3	+	+	+	+			+		+										
ИП 4		+		+															
ИП 5			+								+		+						
ИП 6					+						+	+	+						
ИП 7					+	+		+		+	+	+	+	+	+			+	+
ИП 8		+									+	+	+	+	+				+
ИП 9					+		+	+	+	+	+	+	+	+	+	+	+		+
ИП 10				+			+	+	+	+	+	+	+	+	+	+	+		+
ИП 11			+			+	+	+	+		+	+	+			+	+		
ИП 12											+	+	+			+	+	+	
ИП 13						+					+	+	+			+		+	
ИП 14				+	+	+		+		+	+	+	+			+	+		
ИП 15	+	+		+		+	+		+		+	+	+						
ИП 16			+		+	+	+	+	+	+	+	+	+			+			
ИП 17						+	+	+	+	+	+	+	+	+	+	+	+	+	
ИП 18						+		+			+	+	+			+	+		
ИП 19						+		+		+	+	+	+		+	+	+		+
ИП 20				+	+	+	+		+		+	+	+	+	+	+	+		
ИП 21								+		+	+	+	+				+	+	
ИП 22			+		+			+		+	+	+	+			+		+	
ИП 23					+	+					+	+	+	+	+				+
ИП 24					+	+	+	+	+	+	+	+	+	+	+		+	+	+
ИП 25					+	+					+	+	+	+	+				+
ИП 26	+	+				+	+		+		+	+	+	+					
ИП 27			+			+	+	+	+	+	+	+	+						
ИП 28		+			+		+	+	+	+	+	+	+			+			
ИП 29	+					+	+	+	+	+	+	+	+				+	+	
ИП 30		+				+	+		+		+	+	+						
ИП 31								+		+	+	+	+						
ИП 32		+									+	+	+						
ИП 33	+				+	+		+		+	+	+	+					+	
ИП 34		+		+						+	+	+	+					+	
ИП 35						+	+	+	+	+	+	+	+					+	+
ИП 36						+		+		+	+	+	+				+	+	+
ИП 37						+		+		+	+	+	+	+	+		+	+	+
ИП 38						+		+		+	+	+	+	+	+		+	+	+

Changes and additions to the educational-professional program

ELECTRIC MACHINES AND APPLIANCES

The second (master's) level of higher education

1. Changes in curricula according to the requirements of the educational department of the department of the educational department of KPI named after Igor Sikorsky are taken into account:

- The educational components "Patent Science and Intellectual Property" and "Fundamentals of Sustainable Development of Society" were postponed to the first semester.
- All elective educational components from the F-catalog were removed from the first semester and placed in the second semester in the amount of 22.5 credits.
- The components of the educational program "Fundamentals of Sustainable Development of Society", "Practical Course of Foreign Language Scientific Communication" and "Startup Project Management" have been transferred from the category of general elective disciplines of the general training cycle to the category of general compulsory disciplines.
- Two course works are allocated in separate educational components, accordingly the volume of each of two disciplines Special electric cars and Electric cars of automation systems is reduced by one credit.

2. Made changes to the structural logical schemes: provided a transcript of each discipline, changed the links between them

3. The matrix of correspondence of program competences to components of the educational program and a matrix of maintenance of program results of training by the corresponding components of the educational program are corrected.

The educational and professional program was developed by the project team

Project team leader

Yuriy Vaskovsky, Doctor of Technical Sciences, Professor

Members of the project team

Mykola Reutskiy, PhD, Associate Professor

Sergiy Tsivinskiy, PhD, Associate Professor