

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

**KYIV NATIONAL UNIVERSITY
TECHNOLOGIES AND DESIGN**

APPROVED BY THE ACADEMIC COUNCIL

Chairman of the Academic Council of KNUTD

_____ **Ivan GRISCHENKO**
(protocol from «_» ____ 2021 p. № __)

EDUCATIONAL AND SCIENTIFIC PROGRAM

**ELECTRIC POWER ENGINEERING, ELECTRICAL
ENGINEERING AND ELECTROMECHANICS**

Higher education level _____ **third (educational and scientific)** _____

Higher education level _____ **Doctor of philosophy** _____

Area of expertise _____ **14 Electrical Engineering** _____

Specialty **141 Electrical power engineering, electrical engineering and
electromechanics**

Qualification **Doctor of Philosophy in Electrical Power Engineering, Electrical
Engineering and Electromechanics**

Kyiv 2021

APPROVAL PAPER
Educational scientific program
**ELECTRIC POWER ENGINEERING, ELECTRICAL ENGINEERING AND
ELECTROMECHANICS"**
(name of educational program)

Level of higher education third (educational and scientific)
(name of the level of higher education)

Degree of higher education doctor of philosophy
(the name of the degree of higher education)

Branch of knowledge 14 Electrical Engineering
(area code and name)

Specialty 141 Electrical power engineering, electrical engineering and electromechanics
(code and name of the specialty)

Vice-rector for scientific and pedagogical activity (educational activity)
Oksana MORGULETS
(date) (signature)

Approved by the Academic Council of the Educational and Scientific Institute of Engineering and Information Technology
(full name of the faculty / institute)

Minutes dated " 20 " January 2021 No. 5

Director Educational and Scientific Institute of Engineering and Information Technology
Igor PANASYUK
(date) (signature)

Head of the Department of Doctoral and Postgraduate Studies
Svitlana ARABULI
(date) (signature)

Discussed and recommended at the meeting of the Department of Computer Engineering and Electromechanics

Minutes dated « 18 » January 2021 року No. 7

Head of Department Computer Engineering and Electromechanics
Борис ЗЛОТЕНКО
(дата) (підпис)

Гарант освітньої програми
Olexandr SHAVOLKIN
(date) (signature)

Put into effect by order of KNUTD from « ___ » _____ 2021 year No. ___.

FOREWORD

РОЗРОБЛЕНО: Київський національний університет технологій та дизайну

РОЗРОБНИКИ:

Guarantor of the educational program Shavolkin Oleksandr Oleksiiiovych, Doctor of Technical Sciences, Professor, Professor of the Department of Computer Engineering and Electromechanics, Kyiv National University of Technology and Design

Members of the working group:

Shvedchikova I.O, Doctor of Technical Sciences, Professor, Professor of the Department of Computer Engineering and Electromechanics, Kyiv National University of Technology and Design

Burmistenkov O.P, Doctor of Technical Sciences, Professor, Professor of the Department of Computer Engineering and Electromechanics, Kyiv National University of Technology and Design

Stanovsky E.Y, graduate student of the Department of Computer Engineering and Electromechanics, Kyiv National University of Technology and Design

EXTERNAL STAKEHOLDER REVIEWS:

- 1) Mikhalsky VM Head of the IED Department of the NAS of Ukraine
- 2) Semenystyy OV Director of PROMELEKTROMEREZHBUD LLC
- 3) Gudilina OO Director of DOYCHELEKTROSERVICE LLC
- 4) Varvarenko VV Director of AMATI-SERVICE LLC
- 5) Gordeev MO technical director of IBS SERVICE LLC

1. Profile of the educational-scientific program Electric power, electrical engineering and electromechanics

1 - General information	
Full name of the institution of higher education and structural unit	Kyiv National University of Technology and Design Department of Computer Engineering and Electromechanics
Higher education degree and qualification in the original language	The level of higher education is the third (educational and scientific). Degree of higher education - Doctor of Philosophy. Field of knowledge - 14 Electrical engineering Specialty - 141 Electric power, electrical engineering and electromechanics
Type of diploma and scope of educational program	Doctor of Philosophy, single, 48 ECTS credits.
Availability of accreditation	
Cycle / level	The National Qualifications Framework of Ukraine is the eighth level.
prerequisites	Availability of master's degree and specialist (engineer)
Language (s) of instruction	Ukrainian
Term of the educational program	-
Internet address of the permanent placement of the description of the educational program	http://knutd.edu.ua/ekts/
2 - The purpose of the educational program	
<p>Training of specialists with in-depth knowledge, as well as basic and professional competencies in the field of power engineering, electrical engineering and electromechanics, aimed at acquiring professional competencies for scientific, research and innovation activities and implementation of the results obtained.</p> <p>The main goals of the program are: production of new ideas, solving complex problems of research and innovation, mastering the methodology of scientific and pedagogical activities, as well as conducting own research, the results of which have scientific novelty, theoretical and / or practical significance.</p>	
3 - Characteristics of the educational program	
Subject area	<p>The program is designed as an optimal combination of academic and professional requirements. It is focused on the formation of applicants' competencies for the acquisition of in-depth knowledge of the specialty, mastery of general scientific (philosophical) competencies, acquisition of universal research skills and presentation of their own research results in oral and written form, in particular, in a foreign language.</p> <p>Compulsory disciplines - 75%, of which - compulsory disciplines of vocational training - 44%, general training - 34%, knowledge of a foreign language - 22%; disciplines of free choice of the applicant, providing professional training - 25% (selected from the university-wide catalog in accordance with the approved procedure at the University).</p>
Orientation of the educational program	Educational and scientific program of preparation of the doctor of philosophy.
The main focus of the educational	Emphasis is placed on the formation and development of professional competencies in the field of power engineering, electrical engineering and

program	electromechanics; study of theoretical and methodological provisions, organizational and practical tools.	
Features of the educational program	The program focuses on the field of energy with renewable sources and energy saving in electrical technology and electromechanics.	
4 - Suitability of graduates for employment and further study		
Suitability for employment	Higher education institutions, scientific institutions, research and production associations, public authorities, administration and local self-government, etc. Graduates are able to perform the professional work of a teacher of higher education, a researcher in research and design institutions, research and production associations, analyst-consultant, head of structural unit, chief engineer, expert in ensuring and determining quality and energy efficiency.	
Further training	Lifelong learning to improve professional, scientific and other activities. Opportunity to continue studies to obtain the scientific level of Doctor of Sciences.	
5 - Teaching and Assessment		
Teaching and learning	Student-centered and problem-oriented learning, research practice and self-study are used. In this case, theoretical and practical problems that have not been solved in the process of scientific and social development, show the contradiction between the acquired knowledge and what needs to be learned, researched. The element of problem-solving in teaching encourages the subject of cognitive activity to enrich knowledge. Postgraduate students are involved in active and productive activities, observe, listen, comprehend the logic of scientific research, participate in proving a hypothesis, testing the correctness of the problem. Forms of organization of the educational process: lecture, seminar, practical, laboratory, practical training, independent work, consultation, preparation of dissertation.	
Evaluation	Exams, credits, tests, essays, presentations, reports, design and analytical tasks.	
6 - Program competencies		
Integral competence (IC)	Ability to produce new ideas, solve complex problems in the field of electrical engineering in professional and / or research and innovation, apply the methodology of scientific and pedagogical activities, as well as conduct their own research, the results of which have scientific novelty, theoretical and practical significance.	
General competencies (GC)	GC 1	Ability to abstract thinking, analysis and synthesis.
	GC 2	Ability to develop and manage projects.
	GC 3	Ability to generate new ideas (creativity).
	GC 4	Formation of a systematic scientific / artistic worldview, professional ethics and general cultural outlook.
	GC 5	Ability to communicate in a foreign language.
	GC 6	Ability to use information and communication technologies.
	GC 7	Ability to work in an international context.
Professional competencies (PC)	PC 1	Ability to carry out scientific and pedagogical activities.
	PC 2	Ability to critically analyze and evaluate modern scientific achievements, generate new ideas in solving research and practical problems.
	PC 3	Ability to organize and conduct system-structural analysis of research results and make practical recommendations for the

		design of facilities in the field of electrical engineering.
	PC 4	Ability to use effective methods and tools for research of power engineering, electrical engineering and electromechanics in independent research.
	PC 5	Ability to design and conduct comprehensive research, based on a holistic systemic scientific worldview using knowledge in the history and philosophy of science.
	PC 6	Ability to apply the skills of analytical experimental and associative creative work in generating fundamentally new design ideas and technologies in the field of electrical engineering, including resource-saving and environmentally friendly.
	PC 7	Ability to focus on the choice of mathematical apparatus to optimize production processes, adequately use various sources of technical creativity, apply modern advances in power engineering, electrical engineering and electromechanics and form their own innovative proposals with knowledge of the principles of patent and license rights.
	PC 8	Skills of creative analytical work. Creativity, ability to think systematically.
	PC 9	Knowledge of the principles of system-structural approach to the design of facilities in the field of electrical engineering with improved technical and economic indicators.
	PC 10	Ability to use sources of activation of creative search, inclusion in work of conscious and subconscious intuitive and logical connections, associations, non-standard decisions.

7 - Program results of learning

Knowledge and understanding:

PRL 1	Know modern methods of assessing the parameters of electricity quality in accordance with international standards, research and modeling in the field of power engineering, electrical engineering and electromechanics.
PRL 2	To know the principles of realization of modern structures of renewable energy and means of energy saving in electric power, electrical engineering and electromechanics.
PRL 3	Understand the consequences of the impact of technical solutions in the social, economic and social context.

Application of knowledge and understanding (skills):

PRL 4	Carry out analysis of processes in electrical, electrical and electromechanical equipment, relevant complexes and systems of automated control and regulation of parameters.
PRL 5	Use modern digital information systems and control systems.
PRL 6	Apply a systematic approach, integrating knowledge from other disciplines and taking into account non-technical aspects, when solving theoretical and applied problems of the chosen field of research.
PRL 7	Apply knowledge and understanding to solve problems of synthesis and analysis of systems in energy, electrical technology and electromechanics.
PRL 8	Be able to combine theory and practice, as well as make decisions and develop a strategy for solving scientific and applied problems, taking into account universal values, social, state and industrial interests.
PRL 9	Have international electrical terminology, basic concepts of design and construction of modern electromechanical and semiconductor devices.
PRL 10	Have the skills of experimental research using modern instruments and processing results.
PRL 11	Evaluate the feasibility and applicability of new methods and technologies in the synthesis of power, electrical and electromechanical systems.

PRL 12	Argue the choice of methods for solving a scientific-applied problem, critically evaluate the results and defend the decisions made.
Formation of judgments:	
PRL 13	Evaluate ethical responsibility for the results obtained and their use.
PRL 14	To communicate freely on professional problems in the state and foreign languages orally and in writing, to discuss the results of professional activity with specialists and non-specialists, to argue their position on debatable issues.
PRL 15	Adhere to critical positions in professional scientific activity, in particular when conducting examinations of scientific works.
PRL 16	It is clear to convey complex scientific ideas and argue them.
8 - Resource support for program implementation	
Staffing	All scientific and pedagogical workers who provide the educational program on qualification, correspond to a profile and a direction of the educational components which are taught; have the necessary experience of pedagogical work and experience of practical work. In the process of organizing training, professionals with experience in research / management / innovation / creative work and / or work in the specialty are involved.
Logistics support	Logistics allows to fully ensure the educational process throughout the training cycle of the educational program. The condition of the premises is certified by sanitary and technical passports that comply with current regulations.
Information and educational and methodical support	The program is fully equipped with an educational and methodological complex of all components of the educational program, the availability of which is presented in the modular environment of the educational process of the University.
9 - Academic mobility	
National credit mobility	Provides for the possibility of academic mobility in some components of the educational program, providing the acquisition of general and / or professional competencies.
International credit mobility	The program develops prospects for participation and internships in joint research projects and academic mobility programs abroad.
Training of foreign applicants for higher education	Training of foreign applicants for higher education is carried out according to accredited educational programs.

2. List of components of educational and scientific program and their logical sequence

2.1.1 List of components of the educational component of the educational-scientific program of the third (educational-scientific) level of higher education

Code	Components of the educational program (academic disciplines, semester work, practice)	Number of credits	Form of final control
1	2	3	4
Mandatory components of the educational program			
General training cycle			
MC 1	Philosophy of science and research methodology	4	exam
MC 2	Foreign language for academic purposes	8	credit / exam
MC 3	Information and communication technologies in scientific research	4	credit
MC 4	Intellectual property and commercialization of scientific research	4	credit
Total from the cycle		20	

Cycle of professional training			
MC 5	Pedagogical skills in high school	4	credit
MC 6	Pedagogical practice	4	credit
MC 7	Electrical complexes and systems	4	exam
MC 8	Control and automatic control systems	4	exam
Total from the cycle		16	
The total amount of mandatory components		36	
Selective components of the educational program			
DFCS	Disciplines of free choice of student / graduate student	12	credit / exam
The total amount of sample components		12	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		48	

2.1.2 Content of the scientific component of the educational-scientific program of the third (educational-scientific) level of higher education

Search for scientific sources and their processing. Defining the main tasks of the dissertation. Selection of optimal theoretical and / or experimental methods for their solution. Data mining, processing and analysis of the obtained results. Correction of initial hypotheses and problems in accordance with the results of the analysis. Preparation of scientific results for publication. Approbation of scientific results at scientific conferences of different levels. Generalization of research results. The final definition of the range of problems that will be considered in the dissertation, the establishment of the place of research in the context of the results of other authors. Formation of conclusions and recommendations. Registration of work and submission to the defense. Dissertation defense.

The main scientific results of the dissertation must be covered in at least three scientific publications that reveal the main content of the dissertation. Such scientific publications include:

- at least one article in periodical scientific publications of other states that are members of the Organization for Economic Cooperation and Development and / or the European Union, in the scientific field for which the applicant's dissertation was prepared. Such publication may be equated with publication in publications included in the list of scientific professional publications of Ukraine with the assignment of category "A", or in foreign publications indexed in the databases Web of Science Core Collection and / or Scopus;

- articles in scientific publications included in the list of scientific professional publications of Ukraine with the assignment of category "B" (instead of one article may be included a monograph or a section of a monograph published in co-authorship). A scientific publication in the edition referred to in the first - third quartiles (Q 1 - Q 3) according to the classification SCImago Journal and Country Rank or Journal Citation Reports, is equated to two publications, which are credited in accordance with the first paragraph of this paragraph.

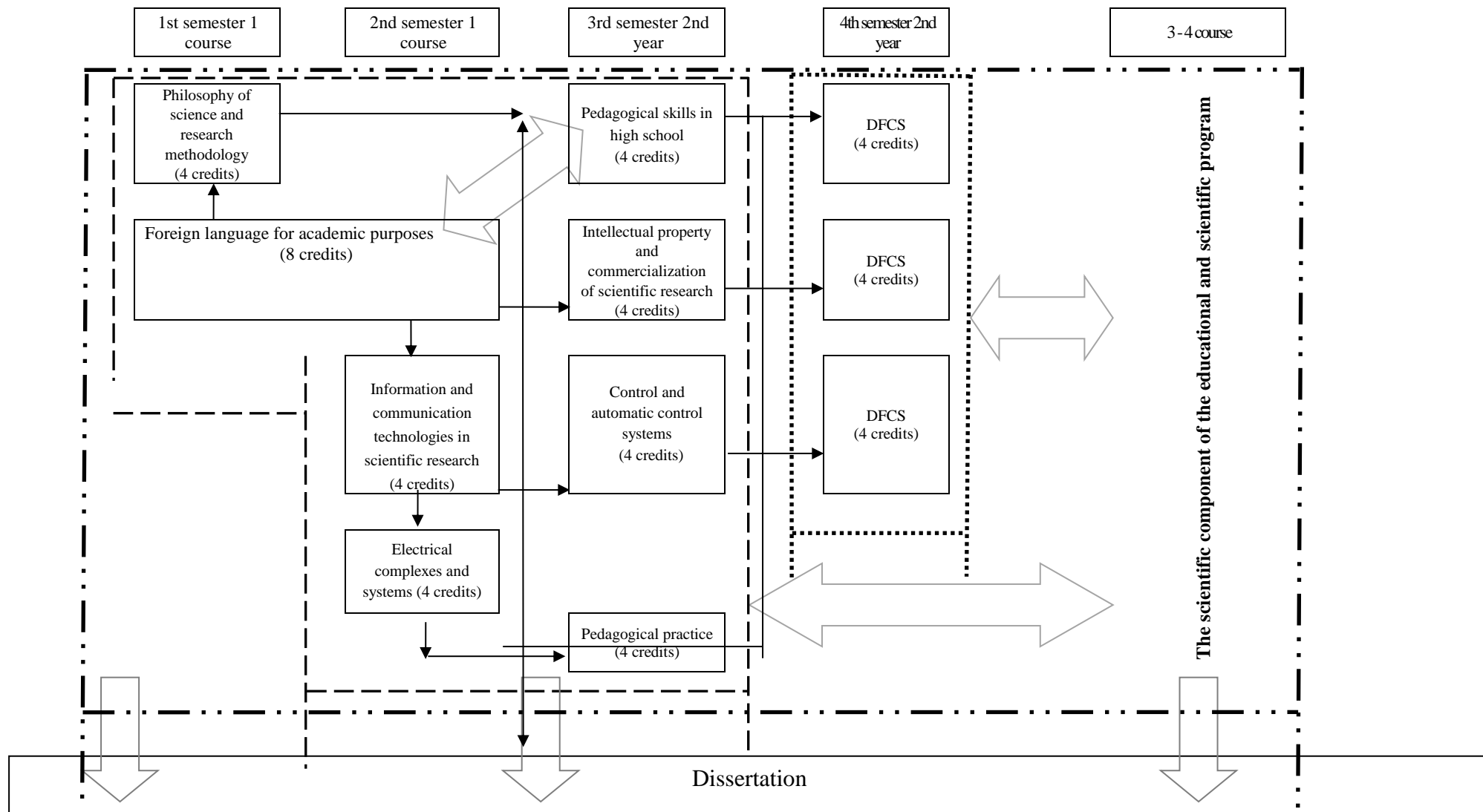
Scientific publications are credited on the topic of the dissertation subject to the following conditions:

- substantiation of the obtained scientific results in accordance with the purpose of the article (task) and conclusions;

- publication of articles in scientific professional publications, which on the date of their publication are included in the list of scientific professional publications of Ukraine, approved in the manner prescribed by law;
- publication of articles in scientific periodicals of other states in the scientific field for which the applicant's dissertation was prepared, provided that the presentation of the dissertation materials, determined by the council, is complete;
- publication of no more than one article in one issue (issue) of a scientific publication.

2.2 Structural and logical scheme of preparation of the doctor of philosophy of the educational and scientific program
Power engineering, electrical engineering and electromechanics

in specialty 141 Power engineering, electrical engineering and electromechanics



3. Form of certification of applicants for higher education

Forms of certification of applicants for higher education	Certification of a graduate of the educational program is carried out in the form of defense of the dissertation
Document of higher education	Doctor of Philosophy with educational qualification: Doctor of Philosophy in Power Engineering, Electrical Engineering and Electromechanics.

4. Matrix of correspondence of program competences to components of the educational-scientific program

	GC 1	GC 2	GC 3	GC 4	GC 5	GC 6	GC 7	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9	PC 10
MC1	*	*	*	*			*	*	*			*					
MC2		*			*	*	*										
MC3	*	*	*		*	*	*	*						*			
MC4	*	*	*	*		*	*	*					*			*	
MC5				*		*	*	*							*		*
MC6				*		*	*	*					*				*
MC7		*			*	*			*	*	*	*		*	*	*	
MC8		*			*	*			*	*	*	*	*	*	*	*	*

5. Matrix for providing program learning outcomes with relevant components of the educational and scientific program

	PRL 1	PRL 2	PRL 3	PRL 4	PRL 5	PRL 6	PRL 7	PRL 8	PRL 9	PRL 10	PRL 11	PRL 12	PRL 13	PRL 14	PRL 15	PRL 16
MC 1	*							*					*		*	
MC 2									*					*		
MC 3					*											
MC 4			*			*		*			*	*				
MC 5		*										*	*			*
MC 6							*		*			*		*		*
MC 7	*	*		*	*		*			*	*				*	
MC 8	*	*	*	*	*	*	*	*		*	*			*	*	*