

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
KYIV NATIONAL UNIVERSITY OF TECHNOLOGIES  
AND DESIGN

**APPROVED BY THE SCIENTIFIC  
COUNCIL**

**Chairman of the Academic Council of  
KNUTD**

\_\_\_\_\_ **Ivan GRISHCHENKO**

(Minutes of \_\_\_\_\_ 2021 №)

**EDUCATIONAL AND SCIENTIFIC  
PROGRAM**

**Metrology and information-measuring technology**

Level of higher education third (educational-scientific)

Degree of higher education doctor of philosophy

Field of knowledge 15 Automation and instrumentation

Specialty 152 Metrology and Information and Measurement Technology

Qualification Doctor of Philosophy in Metrology and Information and  
Measurement Technology

## LETTER OF AGREEMENT

Educational and scientific program Metrology and information-measuring technology

Level of higher education (third educational and scientific)

Degree of higher education doctor of philosophy

Field of knowledge 15 Automation and instrumentation

Specialty 152 Metrology and information-measuring technology

### **Vice-rector for scientific and pedagogical activities (educational activities)**

\_\_\_\_\_ Oksana Morgulets  
(date) (signature)

### **Approved by the Academic Council of the faculty / institute** Mechatronics and computer technology (full name of the faculty / institute)

Protocol from " \_\_\_\_ " \_\_\_\_\_ 20\_\_ № \_\_\_\_\_

### **Dean of the Faculty / Director of the Institute** Mechatronics and computer technology (full name of the faculty / institute)

\_\_\_\_\_ Volodymyr PAVLENKO  
(date) (signature)

### **Head of the Department of Doctoral and Postgraduate Studies**

\_\_\_\_\_ Svetlana ARABULI  
(date) (signature)

### **Discussed and recommended at the meeting of the department** Computer-integrated technologies and measuring equipment (full name of the department)

Protocol from " \_\_\_\_ " \_\_\_\_\_ 20\_\_ № \_\_\_\_\_

### **Head of Department** applied mechanics and machine engineering (full name of the department)

\_\_\_\_\_ Oleksandr MANOILENKO  
(date) (signature)

### **Guarantor of the educational program**

\_\_\_\_\_ Anna KHIMICHEVA  
(date) (signature)

Put into effect by the order of KNUTD from " \_\_\_\_ " \_\_\_\_\_ 20\_\_ year № \_\_\_\_.

## PREFACE

DEVELOPED: Kyiv National University of Technology and Design DEVELOPERS:

Guarantor of the educational program Anna KHIMICHEVA, Ph.D., Professor, Professor of Applied Mechanics and Machines, Kyiv National University of Technology and Design

Members of the working group:

Hanna KOROGOD, Ph.D., Associate Professor of the Department of Computer Sciences, Kyiv National University of Technology and Design

Antonina VOLIVACH, Ph.D., Associate Professor, Department of of Computer Sciences, Kyiv National University of Technology and Design

Oleksiy DZYUBA, graduate student of the Department of Applied Mechanics and Machines of Kyiv National University of Technology and Design

# 1. Profile of the educational-scientific program Metrology and information-measuring technology

<b>1 - General information</b>	
<b>Full name of the institution of higher education and structural unit</b>	Kyiv National University of Technology and Design Department of Computer Integrated Technologies and Measuring Engineering
<b>Degree of higher education and qualification in the original language</b>	Level of higher education - third (educational and scientific) Degree of higher education - Doctor of Philosophy Field of knowledge - 15 Automation and instrument making Specialty - 152 Metrology and information-measuring equipment
<b>Type of diploma and scope of educational program</b>	Doctor of Philosophy, single, 48 ECTS credits.
<b>Availability of accreditation</b>	-
<b>Cycle / level</b>	The National Qualifications Framework of Ukraine is the eighth level.
<b>Prerequisites</b>	Master's Degree
<b>Language (s) of instruction</b>	Ukrainian
<b>Term of the educational program</b>	-
<b>Internet address of the permanent post of the description of the</b>	<a href="http://knutd.edu.ua/ekts/">http://knutd.edu.ua/ekts/</a>
<b>2 - The purpose of the educational program</b>	
Training of specialists with deep knowledge, as well as basic and professional competencies in the field of 15 Automation and instrumentation, aimed at acquiring general and professional competencies to provide training of highly qualified personnel for research and design and analytical activities, scientifically sound consulting in the field of metrology, information and measurement technology, standardization and certification, as well as teaching. The main objectives are to acquire in-depth knowledge of the specialty, mastery of general scientific (philosophical) competencies, acquisition of universal skills of the researcher and presentation of own research results in oral and written form, in particular, in state and foreign languages.	
<b>3 - Characteristics of the educational program</b>	
<b>Subject area</b>	The program is focused on the formation of applicants' competencies for the acquisition of deep knowledge, skills and abilities in the specialty. The program is designed as an optimal combination of academic and professional requirements. It is focused on the formation of applicants' competencies for acquiring in-depth knowledge of the specialty, possession of general scientific (philosophical) competencies, acquiring universal research skills and presenting their own research results orally and in writing, in particular, state and foreign languages. Compulsory educational components of academic 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%, are selected from the general university catalog in accordance with the approved procedure at the University.
<b>Orientation of the educational program</b>	Educational and scientific program training doctor philosophy.
<b>The main focus of the program</b>	General program: Metrology and information-measuring technology Accent is done on formation and development professional

	competencies in the fields of metrology, standardization, certification and quality, study of theoretical and methodological provisions, organizational and practical tools.
<b>Features of the educational program</b>	It is planned to teach certain disciplines in English. The program is based on innovative project results, taking into account the current state of metrology, information and measurement technology, standardization and certification, focuses on current specializations, within which further professional and scientific activities are possible. Emphasis is placed on the scientific organization of analytical and research project process, the use of heuristic methods aimed at overcoming scientific engineering problems, the development of professional self-improvement, creative thinking and the search for non-standard scientific solutions. The program develops prospects for participation and internships in the structure of national research, industry and project foundations and is implemented in an active research environment.
<b>4 - Suitability of graduates for employment and further study</b>	
<b>Suitability for employment</b>	The graduate is suitable for employment in enterprises, organizations and institutions operating in the field metrology, information and measuring equipment, standardization, certification and quality, research and production associations, institutions of scientific, technical and instrument-making profile. Specialists are able to perform professional work of leading specialists, engineers, designers in institutions and organizations, design bureaus, advertising agencies, media, TV, companies, large and small enterprises working in the field of instrumentation, metrology, standardization, certification, quality and measurement technology, in the fields of scientific and technical activities and education.
<b>Further training</b>	Lifelong learning to improve professional, scientific and other activities. The possibility of continuing education at the scientific level higher education (doctor of sciences).
<b>5 - Teaching and assessment</b>	
<b>Teaching and learning</b>	Student-centered and problem-oriented learning, learning through pedagogical practice and self-study are used. The system of teaching methods is based on the principles of purposefulness, binary - active direct participation of research and teaching staff and students of higher education. Forms of organization of the educational process: lecture, seminar, practical, laboratory classes, practical training, independent work, consultation.
<b>Evaluation</b>	Exams, tests, tests, essays, project work, presentations, reports, portfolios, etc.
<b>6 - Program competencies</b>	
<b>Integrated competence (IC)</b>	Ability to produce new ideas, solve complex problems in a particular field of 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.

<b>General competence (GC)</b>	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 systemic 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.
<b>Special (professional) competencies (PC)</b>	PC1 Ability to carry out scientific and pedagogical activities.
	PC.2. Ability to plan and solve problems of own professional and personal development. Possession of the culture of scientific research, including the use of the latest information and communication technologies
	PC.3. Awareness and understanding of philosophical and ideological principles of scientific and technical analysis and engineering. Possession of methods of analysis of engineering and technical solutions in the field of metrology, information and measurement technology, standardization and certification, current trends and patterns of development of research and development in the context of globalization and internationalization.
	PC.4. Summarize information and be able to present it with emphasis on critical evaluation of a number of options. Scientific and technical assessment of the novelty of the results of research on metrology, information and measurement technology, standardization and certification.
	PC.5. Be able to know and conduct analytical and experimental scientific and technical activities. Ability to apply theoretical knowledge and design skills to master the theory of design, methods of design and research of metrology, standardization, certification and measurement techniques.
	PC.6. Initiate and perform research and design research. Ability to organize and conduct system-structural analysis of the design process of various forms and types of objects of metrology, information and measurement technology, standardization and certification
	PC.7. Creativity. Ability to apply the skills of analytical experimental and associative scientific and technical work in generating fundamentally new project ideas in the field of metrology, information and measurement technology, standardization and certification.
	PC.8. Apply modern information and communication technologies. Ability to navigate in scientific and technical issues in the field of metrology, information and measurement technology, standardization and certification, adequately use a variety of scientific and technical sources, apply modern principles and approaches in solving scientific and technical problems, form their own innovative proposals.

	PC.9. Ability to analyze and synthesize. Be able to perform creative and analytical work. Creativity, ability to think systematically.
	PC.10. Be able to make decisions. Know the principles of system design within the socio-cultural and subject environment and in the context of modern engineering culture.
	PC.11. Ability to adapt to new situations. Ability to use sources of activation of creative search, inclusion in the work of conscious and subconscious intuitive and logical connections, associations, non-standard solutions.
<b>7 - Program learning outcomes (PLO)</b>	
<b>Knowledge and understanding:</b>	
PLO 1	Know the basics of forecasting the development of promising areas of metrology, standardization, certification and measurement technology.
PLO 2	Know the typologies and methods of organizing scientific and engineering projects.
PLO 3	Understand the synthesis of building design solutions based on the implementation of the results of the pre-project analysis.
PLO 4	Know modern ideas about aesthetic and technical requirements of metrology, standardization, certification and measuring equipment.
PLO 5	Modern ideas about the subject-spatial environment as a scientific and technical system; structure, types of elements and connections in this system.
<b>Application of knowledge and understanding (skills):</b>	
PLO 6	Be able to analyze efficiency used techniques and tools of research development, engineering and technical completed task.
PLO 7	Be able to perform technological analysis based on the study of materials for the presentation of scientific results.
PLO 8	Be able to control compliance with the chosen technology of implementation of the scientific result.
PLO 9	Be able to substantiate the theoretical feasibility and practical effectiveness of the implementation of the results of project analysis in the development of engineering and technical tasks of metrology, standardization, certification and measuring equipment.
PLO 10	Be able to develop a scientific concept of the research process, due to the technical task.
PLO 11	Have scientific and practical methods of implementing information in the field of metrology, standardization, certification and measurement technology.
PLO 12	Possess modern systems and technologies of scientific research.
PLO 13	Have advanced techniques and design techniques that take into account psychological characteristics.
PLO 14	Possess tools and mechanisms for organizing research and methodological analysis of research results.
PLO 15	To be able to apply various types of scientific methods of information processing, to carry out processing and analytical interpretation of information, to generalize results of research of project activity
PLO 16	Be able to apply an integrated approach in solving conceptual design problems.
PLO 17	Be able to navigate the current trends and needs of society in order to use them in the current state of metrology, standardization, certification and measurement technology.

<b>Formation of judgments:</b>	
PLO 18	Substantiate and summarize information and present it with emphasis on critical evaluation.
PLO 19	Communicate and argue complex ideas.
PLO 20	Be responsible for your own decisions and results of professional activities
<b>8 - Resource support for program implementation</b>	
<b>Staffing</b>	All scientific and pedagogical workers who provide educational and professional program by qualification, correspond to the profile and direction of the disciplines 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 are involved
<b>Logistics</b>	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.
<b>Information and educational support</b>	The program is fully provided 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.
<b>Staffing</b>	All scientific and pedagogical workers who provide educational and professional program by qualification, correspond to the profile and direction of the disciplines 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 are involved
<b>Logistics</b>	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.
<b>Information and educational support</b>	The program is fully provided 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.
<b>9 - Academic mobility</b>	
<b>National credit mobility</b>	Provides for the possibility of academic mobility in some components of the educational program, providing the acquisition of general competencies.
<b>International credit mobility</b>	The program develops prospects for participation and internships in research projects and academic mobility programs abroad.
<b>Training of foreign applicants for</b>	Training of foreign applicants for higher education is carried out according to accredited educational programs.



# 1. List of components educational and scientific programs and their logical sequence

## 2.1 List components educational and scientific programs the third (educational scientific) level of higher education

Code n / a	Components of the educational program (academic disciplines, semester work, practice)	Number of hours	Form of final control
1	2	3	4
<b>Mandatory components of the educational program</b>			
General training cycle			
OK 1	Philosophy of science and research methodology	4	exam
OK 2	Foreign language for academic purposes	8	credit / exam
OK 3	Information and communication technologies in research	4	test
OK 4	Intellectual property and commercialization of scientific research	4	test
Total from the cycle		<b>20</b>	
Cycle of professional training			
OK 5	Pedagogical skills in high school	4	test
OK 6	Pedagogical practice	4	test
OK 7	Metrology and measuring technology	4	exam
OK 8	Standardization, certification and metrological support	4	exam
Total from the cycle		16	
<b>The total amount of required components</b>		<b>36</b>	
<b>Selective components of the educational program</b>			
<b>DFCS</b>	Disciplines of special professional training	12	exam
<b>The total amount of sample components</b>		<b>12</b>	
<b>TOTAL VOLUME OF THE EDUCATIONAL</b>		<b>48</b>	

### 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 study. 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 to be considered in the dissertation, establishing 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 field of science 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 Web of Science Core Collection and / or Scopus databases;

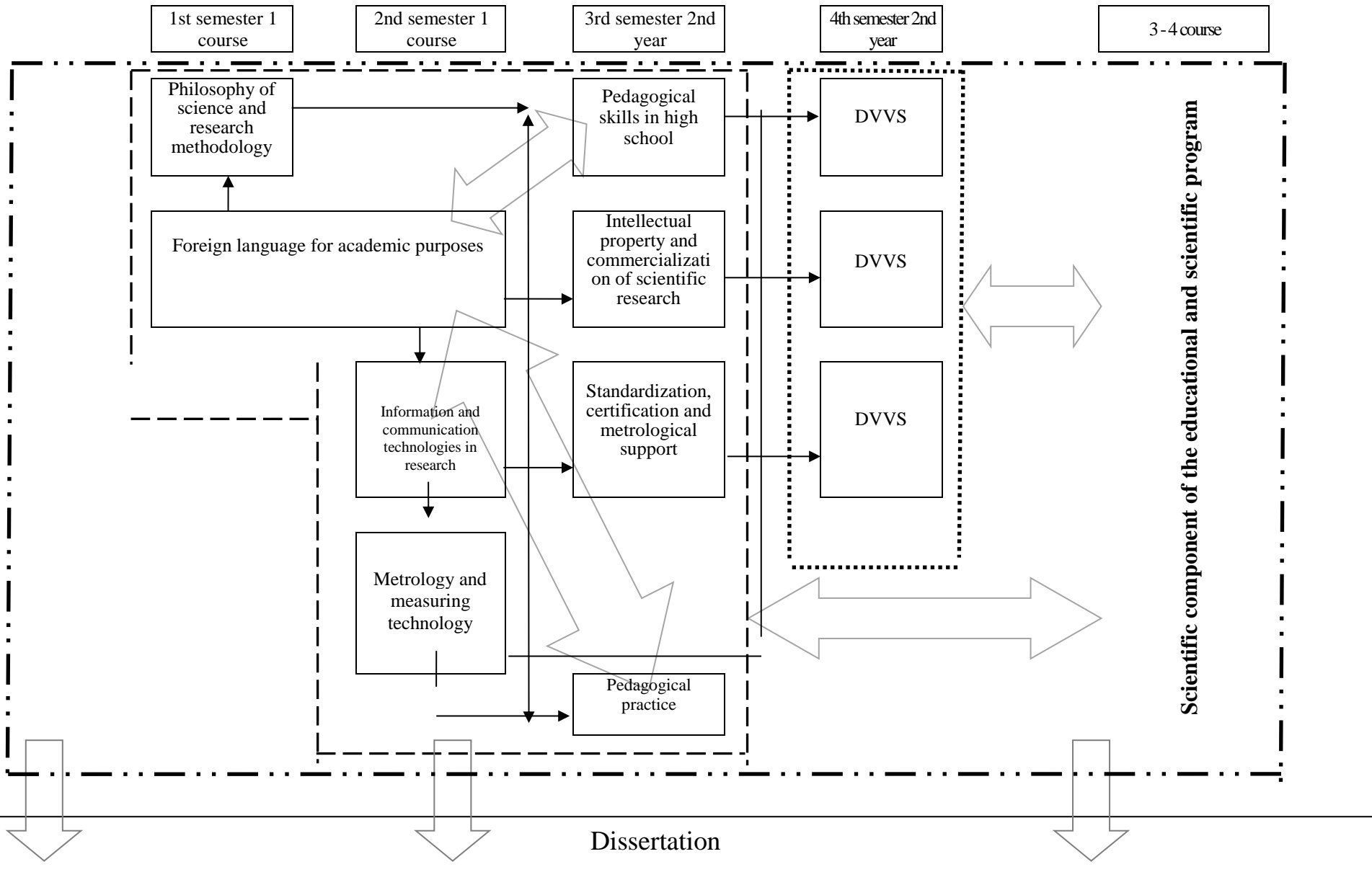
– articles in scientific journals included in the list of scientific professional publications of Ukraine with the assignment of category "B" (instead of one article may be credited monograph or section of the monograph published in co-authorship).

A scientific publication in the first to third quartiles (Q 1 - Q 3) according to the SCImago Journal and Country Rank or Journal Citation Reports classification is equivalent to two publications that are credited according to 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 materials of the dissertation, determined by the council, are complete;
- publication of not more than one article in one issue (issue) of a scientific publication.

## 2.2 Structural and logical scheme of training a doctor of philosophy educational and scientific program metrology and information-measuring technology in the specialty 152 Metrology and information-measuring technology



### 3. Form of certification of applicants for higher education

<b>Forms of certification of applicants for higher</b>	Certification graduate educational and scientific programs are conducted in the form of public
<b>Document of higher education</b>	Diploma of the state standard on awarding the degree of Doctor of Philosophy with the award of qualification: Doctor of Philosophy in Metrology and Information and Measurement Technology

### 4. Matrix compliance software competencies components of the educational and 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	PC 11
<b>OK1</b>				*			*	*		*							*	
<b>OK2</b>					*	*	*		*									*
<b>OK3</b>			*			*	*	*				*			*			
<b>OK4</b>			*	*		*	*	*					*			*		
<b>OK5</b>		*			*	*	*	*			*			*				
<b>OK6</b>	*				*	*	*	*			*						*	
<b>OK7</b>			*				*			*	*					*		
<b>OK8</b>		*				*	*						*				*	

### 5. The matrix of providing program learning outcomes with the relevant components of the educational and scientific program

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15	PLO 16	PLO 17	PLO 18	PLO 19	PLO 20
<b>OK1</b>					*	*		*		*								*		
<b>OK2</b>				*					*										*	
<b>OK3</b>	*	*												*						
<b>OK4</b>			*				*				*							*	*	
<b>OK5</b>	*	*															*		*	
<b>OK6</b>		*	*												*		*	*		
<b>OK7</b>					*							*	*			*		*		*
<b>OK8</b>							*				*	*				*		*		*

## **Timeline of viewing the educational program**

Changes were made to the educational program in accordance with the decision of the Academic Council of the Faculty / Institute of Mechatronics and Computer Technology  
(full name of the faculty / institute)

1. From "\_\_\_" \_\_\_\_\_ 20\_\_, protocol № \_\_\_\_ (revised to the relevance of the needs of stakeholders, changes in part ....)
2. From "\_\_\_" \_\_\_\_\_ 20\_\_, protocol № \_\_\_\_ (changes in the structure of the curriculum and SLS)
3. From "\_\_\_" \_\_\_\_\_ 20\_\_, protocol № \_\_\_\_ (revised in accordance with the Standard of Higher Education in the specialty \_\_\_\_\_ from "\_\_\_" \_\_\_\_\_ 20\_\_,)
4. From \_\_\_\_\_ 20\_\_, Minutes № \_\_\_\_ (comment...)
5. From "\_\_\_" \_\_\_\_\_ 20\_\_, protocol № \_\_\_\_ (modernized with changing competencies and / or program learning outcomes). Approved by the Academic Council of KNU TD from "\_\_\_" \_\_\_\_\_ 20\_\_, protocol № \_\_\_\_.