

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
"Igor Sikorsky Kyiv Polytechnic Institute"**

APPROVED BY
Academic Council
of Igor Sikorsky KPI
(Prot. № 6 from 07.09.2020)
Head of Academic Council
Mykhailo ILCHENKO

ELECTRONICS

EDUCATIONAL AND SCIENTIFIC PROGRAM

third (educational and scientific) level of higher education

in specialty	171 "Electronics"
field of knowledge	17 "Electronics and telecommunications"
qualification	Doctor of Philosophy in Electronics

Entered into force
by order of the rector of
Igor Sikorsky KPI
from 17.09.2020, № 1/282

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PREAMBLE

DEVELOPED by the project group:

Project team leader:

Yamnenko Yuliia Serhiivna, Doctor of Sciences, Professor, Acting Head of the Department of Electronic devices and Systems of Igor Sikorsky KPI

Project team members:

Naida Serhii Anatoliiovych, Doctor of Sciences, Professor, Acting Head of the Department of Acoustic and Multimedia Electronic Systems of Igor Sikorsky KPI

Zheliaskova Tetiana Mykolaivna, Assistant of the Department of Acoustic and Multimedia Electronic Systems of Igor Sikorsky KPI

AGREED:

Scientific and Methodological Commission of the University, specialty 171 Electronics

Head of the SMCU 171 Yuliia YAMNENKO

(Prot. № 2 from 15.05.2020)

Methodical Council of Igor Sikorsky KPI

Head of the Methodical Council

Yurii YAKYMENKO

(Prot. № 7 from 03.09.2020)

Proposals of interested persons are taken into account:

1. Methodical recommendations of the higher education sector of the Scientific and Methodological Council of the Ministry of Education and Science of Ukraine (Prot. № 7 from 06.02.2020) <https://mon.gov.ua/ua/osvita/visha-osvita/naukovo-metodichna-rada-ministerstva-osviti-i-nauki-ukrayini/metodichni-rekomendaciyi-vo>
2. Draft standard of higher education in specialty 171 Electronics (PhD), posted on the website of the Ministry of Education and Science of Ukraine for public discussion <https://mon.gov.ua/ua/osvita/visha-osvita/naukovo-metodichna-rada-ministerstva-osviti-i-nauki-ukrayini/proekti-standartiv-vishoyi-osviti>
3. Comments and suggestions of stakeholders based on the results of public discussion:
 - scientific and pedagogical staff of the Department of Electronic Devices and Systems and the Department of Acoustic and Multimedia Electronic Systems;
 - applicants for higher education who study in educational programs in the specialty 171 Electronics;
 - specialists of the educational and methodical department of Igor Sikorsky KPI;
 - specialists in the field of Electronics and Telecommunications (reviews and letters of support are added).

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1. PROFILE OF THE EDUCATIONAL PROGRAM

1 – General information	
Full name of the higher education institution and institute / faculty	National Technical University of Ukraine " Igor Sikorsky Kyiv Polytechnic Institute", Faculty of Electronics
Degree of higher education and title of qualification in English	Degree - Doctor of Philosophy (PhD) Qualification - Doctor of Philosophy in Electronics
The official title of the educational program	ELECTRONICS
Type of diploma and scope of educational program	PhD degree The standard term of study is 4 years The volume of the educational component is 40 credits ECTS
Cycle / level of higher education	NQF of Ukraine – 8 level FQ-EHEA – the third cycle EQF-LLL – 8 level
Availability of accreditation	Accreditation is expected in 2021.
Prerequisites	Having a master's degree
Forms of study	Full-time, part-time
Language (s) of instruction	Ukrainian
Term of the educational program	Until the next review
Internet address of the permanent placement of the educational program	https://osvita.kpi.ua/op
2 – The purpose of the educational program	
<p>Training of highly qualified, competitive electronics professionals for successful professional and scientific activities, able to solve complex problems related to research and application of a systematic approach to the study of processes and patterns in electronic devices and systems, which involves the development of new and application of existing technologies, devices and systems of electronics, capable of working in institutions of higher education, research institutions and leading enterprises in Ukraine and abroad.</p>	

3 – Characteristics of the educational program	
Subject area	<p><i>Object of activity:</i> physical processes and phenomena, circuitry and system solutions that are the basis for the operation of electronic components, devices and systems.</p> <p><i>Learning objectives:</i> training of specialists capable of solving complex problems in professional, research and innovative activities in the field of development, design, production and modernization of electronic devices and systems based on scientific methods of cognition, which involves a deep rethinking of existing and creation of new holistic knowledge.</p> <p><i>Theoretical content of the subject area:</i> fundamental principles, concepts of construction, modeling, design and optimization of modern electronic components and systems.</p> <p><i>Methods, techniques and technologies:</i> research of processes in electronic devices, systems; planning of experiment with processing of results, development and substantiation of circuit and system solutions, modern computer and information technologies, methods of machine learning, artificial intelligence and cloud computing.</p> <p><i>Tools and equipment:</i> electronic components, equipment, devices and systems, control and measuring equipment, control and regulation systems, power supply of electronic equipment, display and registration of information, electronic systems for various purposes, in particular, for communication, telecommunications, multimedia, acoustoelectronics and acoustics, distributed systems of electricity generation, computer and microprocessor technology, software for analysis, calculation and modeling of processes, design of devices and systems of electronics.</p>
Orientation of the educational program	Educational and scientific
The main focus of the educational program	Special education in electronics, in particular, its physical fundamentals, materials and technologies, industrial and power electronics, acoustoelectronics and acoustics, analog and digital circuitry, converter and microprocessor technology, electronic components and systems with the acquisition of research skills to implement scientific and teaching career.

Features of the program	<p>The educational-scientific program includes educational disciplines of the educational-professional program and additional disciplines by specialization, which deepen knowledge from special sections of fundamental and professional-oriented disciplines and provide research competencies for further educational-scientific activity.</p> <p>Students have the opportunity to study double degree programs with Tallinn University of Technology (Estonia), West Pomeranian University of Technology (Szczecin, Poland), Dresden University of Technology (Germany), Korean Institute of Science and Technology and other foreign universities with which relevant agreements are in force.</p>
4 – Suitability of graduates for employment and further study	
<p>Doctor of Philosophy in Electronics has the right to obtain the degree of Doctor of Science and to obtain additional qualifications in the system of adult education. According to DK003:2008 the opportunity to hold primary positions in accordance with the first and second classification groups.</p> <p>2144 Professionals in electronics and telecommunications</p> <ul style="list-style-type: none"> - researcher (electronics, telecommunications) - junior researcher (electronics, telecommunications) - researcher-consultant (electronics, telecommunications) <p>2149 Professionals in other fields of engineering</p> <ul style="list-style-type: none"> - research engineer <p>2310 Teachers of universities and higher educational institutions</p> <p>2359 Other education professionals</p>	
5 – Teaching and assessment	
Teaching and studying	<ul style="list-style-type: none"> - lectures, practical and seminar classes, computer - workshops, laboratory and calculation works, practices, interactive workshops - in classroom, remote, mixed format; - carrying out classes with the involvement of professionals-practitioners in the field, including in the territories of partner companies; - participation in scientific, scientific and technical international and interdisciplinary conferences, seminars, projects, trainings; - independent work with the use of methodological and scientific information sources; - participation in groups for the development of research projects; - consultations with scientific and pedagogical workers.

Assessment	<p>All types of educational activities and control measures (oral and written tests, exams, testing) are evaluated in accordance with the rating system of assessment on a 100-point scale with subsequent translation into grades of the university scale.</p> <p>The study ends with the writing and public defense of the dissertation,</p>
6 – Program competencies	
Integral competence	Ability to solve complex problems in electronics, including research and innovative activity, which involves a deep rethinking of existing and the creation of new holistic knowledge and / or professional practice.
Common Competences (CC)	CC 1 Ability to abstract thinking, analysis and synthesis
	CC 2 Ability to search, process and analyze information from various sources
	CC 3 Ability to work in an international context
	CC 4 Ability to initiate research and innovation projects and work autonomously during their implementation
	CC 5 Ability to use adequate methods of effective interaction with representatives of different groups (social, cultural and professional)
	CC 6 Ability to communicate in a foreign language to a sufficient extent to present and discuss the results of own scientific work orally and in written form, as well as for a full understanding of foreign scientific texts in the specialty
Professional competencies (PC)	PC 1 Ability to perform original research, achieve scientific results that create new knowledge in electronics and related interdisciplinary areas and can be published in leading scientific journals with electronics and related industries
	PC 2 Ability to adhere to research ethics as well as the rules of academic integrity in research and scientific and pedagogical activities
	PC 3 Ability to use information, communication and multimedia technologies, mathematical and computer modeling of processes in electronic devices and systems, databases, artificial intelligence methods, cloud computing, other electronic resources, specialized software in scientific, professional and educational activities
	PC 4 The ability to evaluate and enhance innovation and commercial attractiveness of development, production and operation of electronic components, devices and systems

	PC 5	Ability to initiate, develop and implement complex innovative and interdisciplinary projects in the field of electronics and related fields, leadership in their implementation
	PC 6	Ability to carry out scientific and pedagogical activities in higher education for Ukrainian-speaking and foreign-speaking audiences using the latest pedagogical approaches and practices, including information technology, multimedia in the educational process for Ukrainian-speaking and foreign-speaking audiences, to diversify teaching methods for better perception of the material
7 – Program learning outcomes		
O 1	To have advanced conceptual and methodological knowledge in electronics and boundary subjects, as well as research skills sufficient for scientific and applied research at the level of the latest world achievements in corresponding field, gaining new knowledge, its use in own research and teaching practice.	
O 2	To read and understand foreign texts in the specialty, freely present and discuss with specialists and non-specialists the results of research, scientific and applied problems of electronics using state and foreign languages, to reflect with enough qualification the results of research in scientific publications in leading international scientific journals.	
O 3	To be able to formulate and test hypotheses; to use appropriate evidence to substantiate the conclusions, in particular, the results of theoretical analysis, experimental research, mathematical and computer modeling, available data from literature, to understand the philosophical concepts of the scientific worldview, the role of science, to explain its impact on social processes.	
O 4	To develop and investigate conceptual, mathematical and computer models of processes and systems, to use them effectively for gaining new knowledge and/or creating innovative products in electronics and related interdisciplinary areas, in pedagogical practice.	
O 5	To plan and perform experimental and/or theoretical research in electronics and related interdisciplinary areas using modern theories, methods, tools, information and communication technologies, to analyze critically the results of own research and the results of other researchers in the context of the whole complex of modern knowledge about the problem investigated.	
O 6	To plan and to organize work and to manage projects in the field of research, development, analysis, calculation, modeling, production and testing of electronic devices and systems.	
O 7	To organize and manage research, innovation and investment activities, business projects and manufacturing processes, taking into account technological parameters, market requirements, existing standards, competitiveness of scientific and engineering products.	
O 8	To develop and carry out all types of classes in higher or professional education, to create a full methodological and didactical support for the disciplines of professional and basic training of all educational and qualification levels, to adapt existing material in accordance with scientific and technological progress, teaching features, existing norms and standards.	
O 9	Be able to use modern methods and technologies of scientific communication in Ukrainian and foreign languages.	
O 10	To know the methodology of scientific research in the subject area and modern methods of planning and setting up experiments, adhere to the basic principles of academic integrity in scientific and educational (pedagogical) activities.	

8 – Resource support for program implementation	
Staffing	In accordance with the personnel requirements for ensuring educational activities for the relevant level of HE (Annex 2 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187
Logistics	In accordance with the technological requirements for material and technical support of educational activities of the relevant level of HE (Annex 3 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 methodical and informational support of educational activities of the relevant level of HE (Annex 5 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187
9 – Academic mobility	
National credit mobility	Possible, subject to the conclusion of relevant agreements between Igor Sikorsky KPI and higher education institutions of Ukraine
International credit mobility	Implemented on the basis of agreements on international academic mobility (Erasmus + K2). Double degree program with Tallinn University of Technology (Estonia), Korean Institute of Science and Technology.
Training of foreign applicants for higher education	Possibility of teaching in a foreign (English) language.

2. LIST OF EDUCATIONAL DISCIPLINES OF EDUCATIONAL COMPONENT OF TRAINING

Code n / a	Components of the educational program (academic disciplines, practices, qualification work)	Number of credits	Form of final control
1. Regulatory (NORMATIVE) educational components			
Educational disciplines for mastering general scientific (philosophical) competencies			
N 1	Philosophical principles of scientific activity	6	Exam
Educational disciplines for acquiring language competencies			
N 2	Foreign language for scientific purposes	6	Exam
Educational disciplines for acquiring language competencies			
N 3	Physical principles of modern electronic systems construction	3	Test
N 4	Signal processing of electronic and acoustic systems	3	Test
N 5	Information and computer technologies in electronics	3	Test
N 6	Current trends in electroacoustic technologies	3	Test
Educational disciplines for acquiring universal competencies of the researcher			
N 7	Organization of scientific and innovative activities	4	Exam
N 8	Pedagogical practice	2	Test
2. SELECTIVE educational components			
V 1	Educational component 1 Faculty catalogue	5	Exam
V 2	Educational component 2 Faculty catalogue	5	Exam
The total amount of normative educational components:		30	
The total amount of selective educational components:		10	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		40	

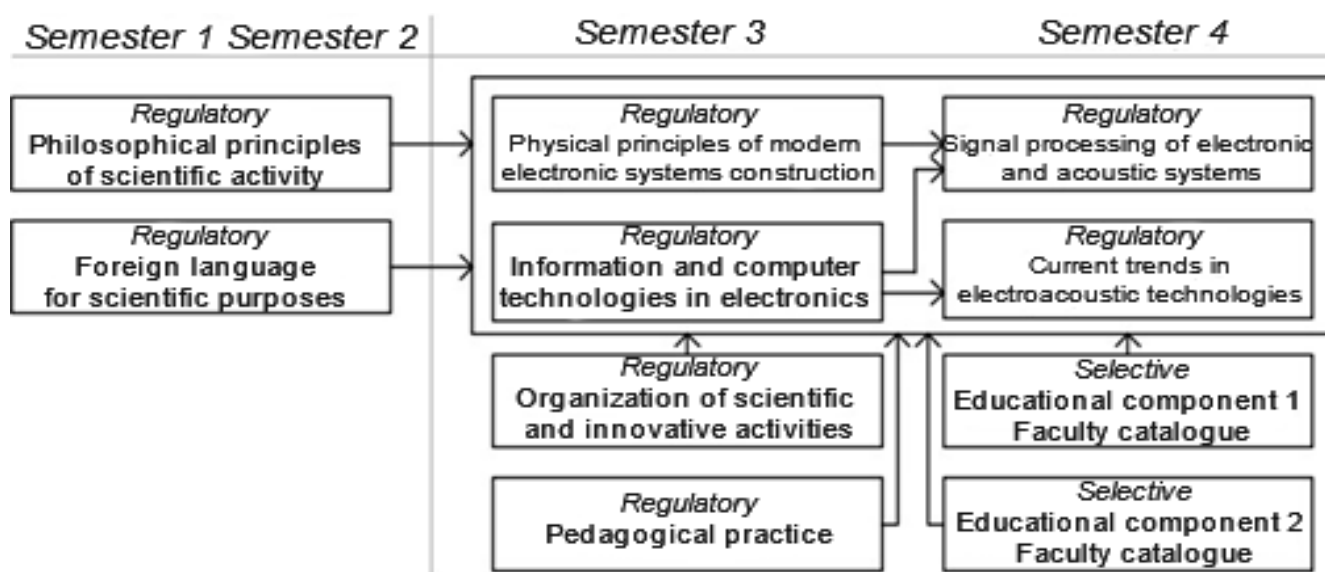
Designations and abbreviations given in the table

N – normative educational component

V – selective educational component

F-catalogue – professional catalog of selective disciplines

3. STRUCTURAL AND LOGICAL SCHEME



**4. MATRIX OF CORRESPONDENCE OF PROGRAM
COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL
PROGRAM**

	N 1	N 2	N 3	N 4	N 5	N 6	N 7	N 8
CC 1	+						+	
CC 2	+	+			+			
CC 3		+						+
CC 4					+		+	
CC 5						+		+
CC 6		+						
PC 1			+	+	+		+	
PC 2	+							
PC 3			+	+	+	+		+
PC 4			+	+		+	+	
PC 5							+	
PC 6		+			+			+

**5. MATRIX OF PROVIDING PROGRAM LEARNING OUTCOMES
WITH RELEVANT COMPONENTS OF THE EDUCATIONAL
PROGRAM**

	N 1	N 2	N 3	N 4	N 5	N 6	N 7	N 8
O 1			+		+		+	+
O 2		+			+	+		
O 3	+			+	+			
O 4			+	+	+		+	+
O 5			+	+	+	+	+	
O 6							+	
O 7					+		+	
O 8					+			+
O 9		+						
O 10	+							

6. SCIENTIFIC COMPONENT

Training year	The content of the postgraduate student scientific work	Form of control
1 year	Substantiation of the chosen theme of own scientific research, development of the content, terms of performing and volume of scientific work; selection and substantiation of the methodology of carrying out own scientific research, carrying out an analytical review of the scientific literature in order to understand and realize the existing views, approaches and trends that exist in modern psychological science. Preparation and publication of at least the 1 review article in scientific professional journals on the research theme; participation in scientific-practical conferences (seminars) with publication of abstracts.	Approval of the individual plan of the postgraduate student at the Academic Council of the faculty, reporting on the implementation of the individual plan of the postgraduate student twice a year.
2 year	Carrying out own research with a set of theoretical and empirical methods under the guidance of a supervisor, which involves solving research problems. Preparation and publication of at least 1 article in scientific professional journals on the research theme; 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.
3 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 1 article in scientific professional journals on the research theme; 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.
4 year	Registration of scientific achievements of the postgraduate student in the form of the dissertation, summing up concerning completeness of result coverage of the dissertation in scientific articles according to the current requirements. Implementation of the obtained results and obtaining 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 a conclusion on the scientific novelty, theoretical and practical significance of the dissertation results.

7. FORM OF FINAL CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Graduation certification of higher education students is carried out in the form of public defense of the dissertation. Based on the results of successful defense, the applicant is issued a document of the appropriate sample on the award of the qualification of Doctor of Philosophy in Electronics under the educational and scientific program "Electronics".

Qualification work is checked for plagiarism and after the defense is placed in the repository of University Library for free access. Graduation certification is open and public.