MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
«IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE»

APPROVED BY
Academic Council of Igor Sikorsky Kyiv Polytechnic Institute
(Prot. № 3 from 15.03.2021)
Head of the Academic Council
_____ Mykhailo ILCHENKO

ACOUSTIC ELECTRONIC SYSTEMS AND ACOUSTIC INFORMATION PROCESSING TECHNOLOGY

EDUCATIONAL PROGRAM

for second (Master) level of higher education

Specialty **171 Electronics**

Field of knowledge **17 Electronics and telecommunications**

Qualification **Master on Electronics**

Entered into force from
2021/2022 academic year
by order of the rector
Igor Sikorsky Kyiv Polytechnic Institute
from 19.04.2021, № НОН/89/2021

Kyiv – 2021

PREAMBLE

DEVELOPED by the project team:

Project team leader: Naida Serhii Anatoliyovych, Head of the Department of Acoustic and Multimedia Electronic Systems, Doctor of Technical Sciences, Professor.

Members of the project team:

Drozdenko Oleksandr Ivanovych, Associate Professor of the Department of Acoustic and Multimedia Electronic Systems, Ph.D., Assoc. Prof.

Zhelyaskova Tetyana Mykolayivna, Associate Professor of the Department of Acoustic and Multimedia Electronic Systems, Ph.D.

Parenyuk Dmytro Volodymyrovych, graduate student of the Department of Acoustic and Multimedia Electronic Systems

The Department of Acoustic and Multimedia Electronic Systems is responsible for the training of applicants for higher education according to the educational program.

AGREED:

Scientific and Methodological Commission of the University, specialty 171 Electronics

Head of the SMCU 171 _____ Yulia YAMNENKO

(Prot. № 4 from 02.02. 2021)

Methodical Council of Igor Sikorsky KPI.

Head of the Methodical Council
_____ Yurii YAKYMENKO

(Prot. № 6 from 25.02. 2021)

1. Methodical recommendations of the higher education sector of the Scientific and Methodological Council of the Ministry of Education and Science of Ukraine https://mon.gov.ua/ua/osvita/visha-osvita/naukovo-metodichna-rada-ministerstva-osviti-i-nauki-ukrayini/metodichni-rekomendaciyi-vo
2. Standard of higher education in the specialty 171 Electronics of the second (master's) level https://mon.gov.ua/storage/app/media/vyshcha/standarty/2020/05/2020-zatverd-standart-171-m.pdf
3. Comments and suggestions of stakeholders based on the results of the public discussion:

- scientific and pedagogical workers of the department of acoustic and multimedia electronic systems;
- applicants for higher education who study in educational programs specialty 171 Electronics;
- specialists of the educational and methodical department Igor Sikorsky Kyiv Polytechnic Institute;
- specialists in the field of Electronics and Telecommunications (reviews and letters of support are attached).

Agreed with members of the scientific-methodical commission and the support group of the specialty 171 Electronics Igor Sikorsky Kyiv Polytechnic Institute.

The educational program was considered at the meeting of the Department of Acoustic and Multimedia Electronic Systems., Protocol № 8 of January 20, 2021.

CONTENT

1. Profile of the educational program

1 – General characteristics	
Full name of institution of higher education and institute / faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Faculty of Electronics
Higher education degree and title of qualification in the original language	Degree – Master Educational qualification – Master of electronics
The official name of the educational program	Acoustic electronic systems and acoustic information processing technologies
Type of diploma and scope of the educational program	Master's degree, single, 90 credits, term of study 1 years and 4 months
Availability of accreditation	Certificate of accreditation of the specialty ND 1192632, valid until 01.07.2023
Cycle / level of higher education	NFC of Ukraine – level 7 QF-EHEA – the second cycle EQF-LLL – 7 level
Prerequisites	The presence of a bachelor's degree
Teaching languages	Ukrainian / English
Validity of the educational program	Until the next accreditation
Internet address of the permanent placement of the educational program	https://osvita.kpi.ua/171
2 – The aim of the educational program	
Training of an electronics specialist capable of solving complex specialized problems and practical problems of design, production, operation, maintenance, repair and modernization of electronic speakers, aimed at fruitful and efficient work in a sustainable innovative scientific and technological development of society and the formation of high adaptability education in the context of labor market transformation through interaction with employers and other stakeholders The aim of the educational program corresponds to the development strategy of Igor Sikorsky KPI for 2020-2025 on the formation of the society of the future on the basis of the concept of sustainable development.	

3 – Characteristics of the educational program	
Subject area	*Object of activity*: basic physical processes and phenomena on which the operation of electronic devices, devices and systems, electroacoustic energy conversion, primary and secondary information conversion systems, analog and digital components, processes and systems of collection, storage, protection, processing, transmission of acoustic information and integration of these systems for automation of engineering tasks with use of modern computer equipment and software. *Learning objectives*: acquisition of theoretical and practical knowledge and skills, abilities and other competencies for successful professional activity: use of technologies, materials and devices of electronic equipment; design, manufacture, testing, installation and installation, operation, restoration and modernization of electronic acoustic systems. *Theoretical content of the subject area*: fundamental principles of construction of modern acoustic electronic systems, control and management systems, methods of modeling objects and processes and their optimization, modern computer and information technologies of acoustic information processing, tools of engineering and scientific research, theory of planning and conducting experiments. *Methods, techniques and technologies*: research of processes in electroacoustic devices, devices and systems; planning an experiment with processing the results; modern multimedia, computer and information technologies; application of acoustic information processing technologies in the design of acoustic electronic devices, devices, components and systems. *Tools and equipment*: electronic instruments, devices, components and systems, control and measuring equipment, acoustic electronic systems for various purposes, including equipment for non-destructive acoustic control, registration and display of information, technical vision, microcontroller control systems, software for analysis, calculation and modeling of acoustic processes electronic devices and systems.
Orientation of the educational program	Educational-professional program
Main focus of the educational program	The educational-professional program is aimed at forming in applicants the competencies necessary for: planning experiments, processing their results with general and applied software for the development and maintenance of design documentation and for selecting and justifying optimal circuit solutions for creating acoustic electronic devices and systems. **Keywords:** Acoustic electronic systems; Acoustic information processing technologies; Electroacoustic devices and systems; Acoustic non-destructive testing; Acoustoelectronics; Medical acoustics; Hydroacoustics; Electroacoustics; Acoustic monitoring; Innovative activity.

Features of the educational program	The program is based on the requirements of the European Qualifications Framework for Lifelong Learning (EQF-LLL). Possibility of obtaining higher education in dual form. Participation of students in certificate programs. Students receive special knowledge of modern technologies for processing and protection of acoustic information, electroacoustic devices and systems that belong to the field of electronic acoustic systems and can work at Ukrainian enterprises in the relevant profile. The implementation of the program involves the involvement of specialists and experts in the field of 171 Electronics, as well as representatives of stakeholders.
4 – Suitability of graduates for employment and further study	
Suitability for employment	In accordance with the professional requirements and the State Classification of Occupations SC 003: 2010 graduates can work in the following positions: 2144 Professionals in electronics and telecommunications: – Researcher (electronics, telecommunications) – Junior researcher (electronics, telecommunications) – Researcher-consultant (electronics, telecommunications) – Engineer in the field of electronics and telecommunications; – Sound engineer – Electronic engineer – Electronic engineer of non-traditional and renewable energy production systems – Design engineer (electronics) 2149 Professionals in other fields of engineering: – Research engineer – Debugging and testing engineer (electronics) – Standardization and quality engineer – Engineer – Operation and repair engineer (electronics)
Further training	The Master of Electronics has the right to study the programs of the Doctor of Philosophy.

5 – Teaching and assessment	
Teaching and learning	General learning style – task-oriented. Training is conducted in the form of lectures, seminars, practical classes, laboratory classes, individual lessons. Independent work of students involves the possibility of consultation with the teacher. During teaching, information and communication technologies (e-learning, online lectures, OCW, distance learning courses) are used for individual educational components. - lectures, practical and seminar classes, computer workshops, laboratory and calculation works, practices, interactive workshops - in classroom, distance, mixed format; - conducting classrooms 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; - individual work with the use of methodical and scientific information sources; - participation in research project development groups; - consultations with scientific and pedagogical workers. The study ends with the writing and public defense of the qualification work - master's thesis.
Evaluation	Assessment of students' knowledge is carried out in accordance with the Regulations on the system of assessment of learning outcomes in Igor Sikorsky KPI for all types of classroom and extracurricular work (current, calendar, semester control); oral and written exams, tests.

6 - Program competencies	
Integral competence	Ability to solve complex specialized problems and practical problems characterized by complexity and uncertainty of conditions, during professional activities in the field of electronics, or in the learning process, which involves research and / or innovation in the application of theories and methods of electronics.
General Competences (GC)	
GC 1	Ability to abstract thinking, analysis and synthesis
GC 2	Ability to communicate in the state language both orally and in writing.
GC 3	Ability to communicate in foreign languages both orally and in writing
GC 4	Ability to conduct research at the appropriate level
GC 5	Ability to search, process and analyze information from various sources
GC 6	Ability to generate new ideas (creativity)
GC 7	Ability to interpersonal interaction
GC 8	Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity)
Professional competencies (PC)	
PC 1	Ability to assess the level of existing technologies of the electronic industry in the field of professional activity, the effectiveness of technical solutions
PC 2	Ability to plan and implement innovative projects in the field of electronics, protect intellectual property rights.

PC 3	Ability to systematically solve problems of development, analysis, calculation, modeling of electronic devices, components, devices and systems for various purposes
PC 4	Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic devices, components, devices and systems.
PC 5	Ability to ensure the efficiency and quality of measurements in electronic devices, components, devices and systems.
PC 6	Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.
PC 7	Ability to solve problems of processing and displaying information in modern electronic devices, devices and systems.
PC 8	Ability to assess problem situations and shortcomings in the development, design, commissioning, operation and operation of electronic devices, devices and systems, to formulate proposals for solving problems
PC 9	Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness
PC 10	Ability to analyze, synthesize and optimize modern electronic and acoustic systems, control and management systems, as well as to process information in them.
PC 11	Ability to develop design and technological documentation for the manufacture of electronic acoustic systems designed to work in gases, liquids, and solids, in accordance with industry regulations; to carry out their testing, certification and examination.
PC12	Ability to apply modern methods for the development of new electroacoustic technologies, devices and systems designed for acoustic non-destructive testing, acoustoelectronics, medical acoustics, hydroacoustics, electroacoustics, architectural acoustics, acoustic ecology
7 - Program learning outcomes	
O1	Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia
O2	Model and experimentally study phenomena and processes in electronic devices, devices and systems, in technologies of electronic industry
O3	To cooperate with the customer in the formulation of the technical task and discussion of technical solutions and results of projects, to lead a reasoned professional and scientific discussion
O4	Develop low-waste, energy-saving and environmentally friendly technologies, taking into account the requirements of safety of human life, rational use of raw materials, energy and other resources
O5	Ensure energy and economic efficiency of development, production and operation of electronic equipment
O6	Ensure professional development of team members taking into account the world level of scientific and engineering achievements in the field of development and operation of electronic devices, devices and systems
O7	Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information, critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience

O8	Carry out and coordinate the development, selection, use and modernization of the necessary equipment, tools and methods in the organization of the production process, taking into account technical and technological capabilities, modern science-intensive methods, tools and technical solutions.
O9	Coordinate the work of teams of researchers in the field of research, design, development, analysis, calculation, modeling, production and testing of electronic components, devices and systems, taking into account the requirements of civil and moral values, human rights and freedoms, the rule of law
O10	Choose the best research methods, modify, adapt and develop new methods
O11	Analyze technical and economic indicators, reliability, ergonomics, patent purity, market needs, investment climate and compliance of design solutions, research and development with certain goals and norms of the legislation of Ukraine
O12	To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects
O13	Organize and manage research, innovation and investment activities, business projects and production processes taking into account technical, technological and economic factors
O14	Analyze, synthesize and optimize modern electronic and acoustic systems, control and management systems, as well as process information in electronic acoustic systems.
O15	Develop design and technological documentation for the manufacture of electronic acoustic systems designed to work in gases, liquids, and solids, in accordance with industry regulations; to carry out their testing, certification and examination
O16	Apply modern methods for the development of new electroacoustic technologies, devices and systems designed for acoustic non-destructive testing, acoustoelectronics, medical acoustics, hydroacoustics, electroacoustics, architectural acoustics, acoustic ecology

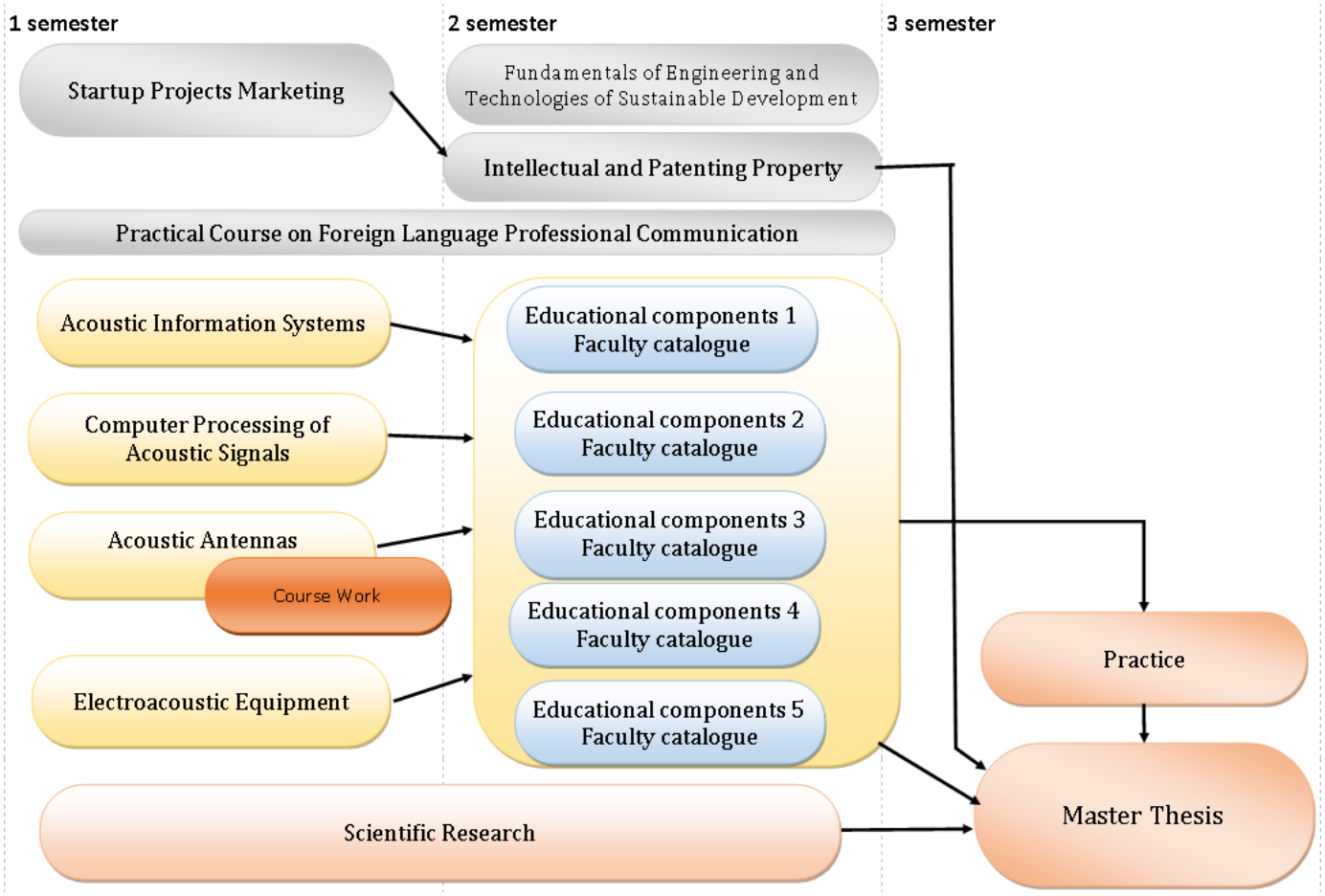
8 - Resource support for program implementation	
Staffing	In accordance with the personnel requirements for ensuring the implementation of educational activities for the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05.2018.
Logistics	In accordance with the technological requirements for material and technical support of educational activities of the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine № 347 dated 10.05.2018. Use of equipment for lectures in the format of presentations, network technologies, in particular on the Sikorsky distance learning platform, demonstration industry equipment during laboratory workshops
Information and educational and methodical support	In accordance with the technological requirements for educational and methodological and informational support of educational activities of the relevant level of HE (Annex 5 to the License Terms), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine № 347 from 10.05.2018 Use of the Scientific and Technical Library of KPI Igor Sikorsky
9 - Academic mobility	
National credit mobility	Possible subject to the conclusion of relevant agreements

International credit mobility	A framework agreement on cooperation between the University of Le Mans (France) and NTUU "KPI" dated June 23, 2015 on international cooperation and a double master's degree in acoustoelectronics
Training of foreign applicants for higher education	Possibility of teaching in Ukrainian in general training groups or in English with the provision of learning Ukrainian as a foreign language

2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code	Components of the educational program (academic disciplines, course projects / works, practices, qualification work)	Number of ECTS credits	Form of final control
1	2	3	4
1. Compulsory educational components			
1.1. General training cycle			
GT 1	Intellectual property and patent science	3	Credit
GT 2	Fundamentals of engineering and technology of sustainable development	2	Credit
GT 3	Practical course of foreign language business communication	3	Credit
GT 4	Marketing startup projects	3	Credit
1.2. Vocational training cycle			
VC 1	Acoustic information systems	5	Exam
VC 2	Acoustic antennas	6	Exam
VC 3	Course project on acoustic antennas	1.5	Credit
VC 4	Computer processing of acoustic signals	5	Exam
VC 5	Electroacoustic equipment	5	Credit
Research (scientific) component			
VC 6	Scientific work on the topic of master's dissertation	7.5	Credit
VC 7	Practice	14	Credit
VC 8	Work on a master's thesis	12	Defence
2. Optional educational components			
2.1. Vocational training cycle (Optional subjetcs from Faculty catalogue)			
VO 1	Educational component 1 of the F-Catalog	5	Exam
VO 2	Educational component 2 of the F-Catalog	5	Exam
VO 3	Educational component 3 of the F-Catalog	5	Exam
VO 4	Educational component 4 of the F-Catalog	4	Credit
VO 5	Educational component 5 of the F-Catalog	4	Credit
The total amount of Compulsory educational components:		**67**	
The total amount of optional components:		**23**	
The amount of educational components that ensure the acquisition of competencies of certain SVO		**45**	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		**90**	

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



4. FORM OF ATTESTATION OF APPLICANTS FOR HIGHER EDUCATION

Attestation of applicants for higher education under the educational-professional program "Acoustic electronic systems and technologies for processing acoustic information" specialty "Electronics" is carried out in the form of public defense (demonstration) of qualification work - master's dissertation and ends with the issuance of a standard document Master of Electronics in the educational-professional program "Acoustic electronic systems and acoustic information processing technologies ".

Attestation is carried out openly and publicly. The master's dissertation is checked for plagiarism and after defense is placed in the repository of the NTB of the university for free access.

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

	GT 1	GT 2	GT 3	GT 4	VC 1	VC 2	VC 3	VC 4	VC 5	VC 6	VC 7	VC 7
GC 1				+	+		+	+	+	+	+	+
GC 2	+	+		+	+	+	+	+	+	+	+	+
GC 3			+							+		
GC 4	+	+								+	+	+
GC 5	+	+		+						+	+	+
GC 6	+	+		+						+	+	+
GC 7				+							+	+
GC 8			+							+	+	+
PC 1	+			+	+			+	+	+	+	+
PC 2	+			+						+		
PC 3					+	+	+	+	+	+	+	
PC 4					+	+	+	+	+	+	+	+
PC 5									+		+	
PC 6	+				+	+	+	+	+	+	+	+
PC 7					+	+			+			
PC 8					+				+	+	+	+
PC 9	+				+			+			+	+
PC 10					+	+	+	+	+			+
PC 11	+					+	+		+			+
PC12					+	+	+	+	+	+	+	+

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

	GT 1	GT 2	GT 3	GT 4	VC 1	VC 2	VC 3	VC 4	VC 5	VC 6	VC 7	VC 7
O1				+	+			+	+		+	+
O2					+			+	+		+	+
O3	+		+	+							+	+
O4		+			+	+	+		+	+	+	
O5		+		+	+				+			
O6	+		+	+						+	+	+
O7	+		+		+	+	+	+	+	+	+	+
O8								+	+		+	+
O9	+			+							+	
O10					+					+	+	
O11	+			+							+	
O12				+	+	+	+	+	+	+		+
O13			+	+								+
O14					+	+	+	+	+		+	+
O15					+	+	+	+	+			+
O16					+	+	+	+	+	+	+	+