

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

APPROVED BY  
Scientific Council  
Igor Sikorsky Kyiv Polytechnic  
Institute  
(Prot. № 10 from 13.12.2021)  
Head of the Academic Council  
Mykhailo ILCHENKO

**ACOUSTIC ELECTRONIC SYSTEMS AND ACOUSTIC  
INFORMATION PROCESSING TECHNOLOGY**

**EDUCATIONAL PROFESSIONAL PROGRAM**

**second (master's) level of higher education**

**in specialty                    171 Electronics**  
**field of knowledge        17 Electronics and telecommunications**  
**qualification                Master's degree in Electronics**

Entered into force from  
2022/2023 academic year  
by order of the rector  
Igor Sikorsky KPI  
on 15.02.2022, № HOH/75/2022

## PREAMBLE

### DEVELOPED BY THE PROJECT GROUP:

*Project team leader:*

Naida Serhiy Anatoliyovych, Doctor of Sciences, Professor, Head of the Department of Acoustic and Multimedia Electronic Systems

*Members of the project team:*

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

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

Damarad Anastasia Vasylivna, graduate student of the Department of Acoustic and Multimedia Electronic Systems

*The Department of Acoustic and Multimedia Electronic Systems is responsible for the preparation of higher education applicants under this educational program*

### AGREED:

Scientific and Methodological Commission of the University, specialty 171 Electronics

Head of the University Commission for Science and Methodology  
for Speciality 171 Yulia YAMNENKO  
(Prot. № 5 from 29.11.2021.)

Methodical Council of Igor Sikorsky KPI  
Deputy Head of the Methodical Council Anatolii MELNYCHENKO  
(Prot. № 2 from 09.12.2021)

### The Program is based on:

the updates in agreement with the Standard of Higher Education, the results of meetings with students and employers, discussions at the meetings of the Department of Acoustic and Multimedia Electronic Systems.

1. Guidelines 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 for 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 employers and other stakeholders on the results of the public discussion:

- scientific and pedagogical staff of the Department of Acoustic and Multimedia Electronic Systems;
- applicants for higher education who study in educational programs speciality 171 Electronics;
- specialists of the educational and methodical department of 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 commission for science and methodology and with the support group of the specialty 171 Electronics of Igor Sikorsky Kyiv Polytechnic Institute.

The educational program was discussed and approved at the meeting of the Department of Acoustic and Multimedia Electronic Systems, Prot. № 6 of November 25, 2021.

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# 1. PROFILE OF THE EDUCATIONAL PROGRAM

## specialty 171 Electronics

<b>1 - General information</b>	
Full name of the higher educational 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 - Master Qualification - Master of Electronics
Cycle / level of higher education	National Qualifications Framework of Ukraine - 7 level QF-EHEA – the second cycle EQF-LLL - 7 level
The official title of the educational program	Acoustic electronic systems and acoustic information processing technology
Type of diploma and scope of educational program	Master's degree, single, 90 credits, term of study 1 year 4 months
Availability of accreditation	Certificate of accreditation of the specialty НД 1192632, valid until 01.07.2023
Prerequisites	Obtained bachelor's degree
Language (s) of instruction	Ukrainian
Term of the educational program	Until the next accreditation
Internet address of the permanent placement of the educational program	<a href="https://osvita.kpi.ua/171_OPPM_AESTOAI">https://osvita.kpi.ua/171_OPPM_AESTOAI</a>
<b>2 - The purpose of the educational program</b>	
Training of an electronics specialist capable of solving complex specialized problems and practical problems of design, production, operation, maintenance, repair, and modernization of electronic acoustic speakers, aimed at productive and efficient work in a sustainable innovative scientific and technological development of society as well as high adaptability of higher education applicants in the context of labor market transformation through interaction with employers and other stakeholders	

### 3 - Characteristics of the educational program

Subject area	<p><i>Object of activity:</i> basic physical processes and phenomena on which the operation of electronic devices, devices and systems, electroacoustic energy conversion, primary and secondary information conversion systems, analogue and digital components, processes, and systems for collecting, storing, protecting, processing, transmitting acoustic information and integrating these systems for automation of engineering tasks using modern computer hardware and software.</p> <p><i>Learning objectives:</i> acquisition of theoretical and practical knowledge and skills, abilities, and 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.</p> <p>Theoretical content of the subject area: fundamental principles of construction of modern acoustic electronic systems, control and management systems, methods of modelling objects and processes and their optimization, modern computer and information technologies of acoustic information processing, engineering, and research tools, planning and conducting theory experiments.</p> <p><i>Methods, techniques, and technologies:</i> 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.</p> <p><i>Tools and equipment:</i> electronic devices, 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 modelling of acoustic processes electronic devices and systems.</p>
Orientation of the educational program	Educational-professional
Main focus of the educational program	<p>The educational and professional program is aimed at forming 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.</p> <p><b>Keywords:</b> Acoustic electronic systems; Acoustic information processing technologies; Electroacoustic devices and systems; Acoustic non-destructive testing; Acoustoelectronics; Medical acoustics; Hydroacoustics; Electroacoustics; Acoustic monitoring; Innovative activity.</p>
Features of the program	<p>The program is based on the requirements of the European Qualifications Framework for Lifelong Learning (EQF-LLL).</p> <p>Possibility of obtaining higher education in dual form.</p> <p>Students' participation in certification programs.</p> <p>Students receive special knowledge of modern technologies for processing and protection of acoustic information, electro-acoustic devices and systems related to the field of electronic acoustic systems and can work at Ukrainian enterprises in the relevant profile.</p> <p>The program implementation suggests the involvement of specialists and experts in the field of 171 Electronics, as well as the representatives from stakeholders.</p>

<b>4 – Graduates’ employment and further training</b>	
Employment	<p>2144 Professionals in electronics and telecommunications:</p> <ul style="list-style-type: none"> <li>– Researcher (electronics, telecommunications)</li> <li>– Junior researcher (electronics, telecommunications)</li> <li>– Researcher-consultant (electronics, telecommunications)</li> <li>– Electronics and Telecommunications Engineer;</li> <li>– Recording engineer</li> <li>– Electronics engineer</li> <li>– Electronics engineer of non-traditional and renewable energy production systems</li> <li>– Design Engineer (Electronics)</li> </ul> <p>2149 Professionals in other fields of engineering:</p> <ul style="list-style-type: none"> <li>– Research engineer</li> <li>– Debugging and testing engineer (electronics)</li> <li>– Standardization and quality engineer</li> <li>– Engineer</li> <li>– Operation and Repair Engineer (Electronics)</li> </ul>
Further training	The graduates holding Master of Electronics degree is eligible continue their studies at the third educational and scientific level of higher education and to obtain additional qualifications in the adult education system.
<b>5 - Teaching and assessment</b>	
Teaching and studying	<p>General learning approach is task-based. Teaching is carried out in the form of lectures, seminars, practical classes, laboratory classes, independent work with and tutorials with the lecturers, individual classes, application of information and communication technologies (e-learning, online lectures, OCW, distance learning courses) for individual educational components.</p> <ul style="list-style-type: none"> <li>-lectures, practical and seminar classes, computer workshops, laboratory and calculation work, practices, interactive workshops - in classroom, remote, blended format;</li> <li>-classes are delivered involving invited professionals and practitioners in the field, and can based in partner companies;</li> <li>-studies include participation in scientific, scientific and technical international and interdisciplinary conferences, seminars, projects, trainings;</li> <li>-independent work includes self-study methodological and research-oriented information sources;</li> <li>-students participate in research and development project groups;</li> <li>-tutorials and consultation with scientific and pedagogical staff.</li> </ul> <p>The final stage of the degree includes submitting and public defence of a qualifying thesis – a master's thesis.</p>
Assessment	Assessment of students' knowledge is provided according to the Regulations on Assessment System of Learning Outcomes in Igor Sikorsky Kyiv Polytechnic Institute for all types of classes and extracurricular work (interim and midterm assessment, summative assessment); including oral and written exams, tests.
<b>6 - Program competencies</b>	
Integral competence	Ability to solve complex specialized problems and practical problems characterized by complex and uncertain conditions during professional activities in the field of electronics, or in the learning process involving research and / or innovation in the application of theories and methods of electronics.

<b>Common Competences (CC)</b>	
CC 1	Ability to demonstrate abstract thinking skills, analyse and synthesize
CC 2	Ability to communicate in the state language both orally and in writing.
CC 3	Ability to communicate in foreign languages both orally and in writing
CC 4	Ability to conduct research at the appropriate level
CC 5	Ability to search, process and analyse information from various sources
CC 6	Ability to generate new ideas (creativity)
CC 7	Ability to interact interpersonally
CC 8	Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / economic activity)
<b>Professional competencies (PC)</b>	
PC 1	Ability to evaluate 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, analyse, calculate, model electronic devices, components, devices and systems for various purposes.
PC 4	Ability to use information, computer and multimedia technologies, methods of modelling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic devices, components, appliances, and systems.
PC 5	Ability to ensure the efficiency and quality of measurements in electronic instruments, components, appliances, and systems.
PC 6	Ability to find the necessary information with the help of modern information resources, analyse and evaluate it.
PC 7	Ability to solve problems of processing and displaying information in modern electronic devices, appliances, and systems.
PC 8	Ability to evaluate problem situations and shortcomings in the development, design, maintenance, operation and application of electronic devices, appliances, and systems, to formulate solutions for problems.
PC 9	Ability to consider in design and technological, engineering, and scientific and technical solutions requirements for the life safety, protection of intellectual property, energy efficiency and environmental friendliness
PC 10	Ability to analyse, 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 manufacturing of electronic acoustic systems designed to work in gases, liquids, and solids, in compliance with the industry regulations; to carry out their testing, certification and examination.
PC 12	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.
<b>7 - Program learning outcomes</b>	
O1	Implement projects for the modernization of production and technology in the field of electronics, the introduction of the latest information and communication technologies, and multimedia.
O2	Model and experimentally study phenomena and processes in electronic devices, appliances, and systems, in technologies of the 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 considering 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 the team members considering the world level of scientific and engineering achievements in the field of development and operation of electronic devices, appliances, and systems.
O7	Carry out information and scientific research using scientific, technical and reference literature, data and knowledge bases, and other sources of information, critically comprehend and interpret existing knowledge and data, identify directions for research and development considering domestic and international experience.
O8	Carry out and coordinate the development, selection, use and modernization of the corresponding equipment, tools, and methods in the organization of the production process, considering technical and technological capabilities, modern science-intensive methods, tools, and technical solutions.
O9	Coordinate the performance of project teams in the field of research, design, development, analysis, calculation, modelling, production and testing of electronic components, devices, and systems, taking into account the requirements of civil and moral values, human rights and freedoms, rule of law.
O10	Choose the best research methods, modify, adapt, and develop new methods.
O11	Analyse technical and economic indicators, reliability, ergonomics, patent purity, market needs, investment climate and compliance of design decisions, research and development with certain goals and norms of Ukrainian legislation.
O12	To generalize modern scientific knowledge in the field of electronics and apply it 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 considering technical, technological, and economic factors.
O14	Analyse, 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 manufacturing 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
<b>8 - Resource support for program implementation</b>	
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 of 30.12.2015 № in the current version. The program is implemented by 11 professors, 14 associate professors, 4 senior lecturers, 6 assistants.
Facilities	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 of 30.12.2015 № 1187 "On approval of licensing conditions for educational activities" in the current version. Facilities include the equipment for delivering lectures in the format of presentations, network technologies, in particular on the Sikorsky Distance learning platform, demonstrations of industry equipment during laboratory workshops.



Information, educational and methodological support	In accordance with the technological requirements for educational and methodological, and informational support of educational activities of the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine of 30.12.2015 № 1187 in the current version. Informational support is provided by the Scientific and Technical Library (STL) of Igor Sikorsky Kyiv Polytechnic Institute.
<b>9 - Academic mobility</b>	
National credit mobility	Possible subject to the conclusion of relevant agreements on national mobility
International credit mobility	A framework agreement on cooperation between the University of Le Mans (France) and Igor Sikorsky Kyiv Polytechnic Institute dated on June 23, 2015 on international cooperation and a double master's degree in acoustoelectronics
Training of international applicants for higher education	Possibility of studying in Ukrainian in general training groups or in English including learning Ukrainian as a foreign language.

## 2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code n / a	Components of the educational program (academic disciplines, practices, qualification work)	Number of credits	Form of final control
1	2	3	4
<b>1. NORMATIVE educational components</b>			
1.1. General training cycle			
GC1	Intellectual and Patenting Property	3	Final tests
GC2	Fundamentals of Engineering and Technologies of Sustainable Development	2	Final tests
GC3	Practical Course on Foreign Language Professional Communication	3	Final tests
GC4	Startup Projects Marketing	3	Final tests
1.2. Vocational training cycle			
VC1	Acoustic information systems	5	Exam
VC2	Acoustic antennas	6	Exam
VC3	Acoustic antennas. Course Project	1,5	Final tests
VC4	Computer processing of acoustic signals	5	Exam
VC5	Electroacoustic equipment	5	Final tests
Research (scientific) component			
VC 6.1	Scientific work on the topic of master's thesis. Part 1. Fundamentals of scientific research	3	Final tests
VC 6.2	Scientific work on the topic of master's thesis. Part 2. Research work on the topic of master's thesis	4,5	Final tests
VC 7	Practice	14	Final tests
VC 8	Master Thesis	12	Defence
<b>2. ELECTIVE educational components</b>			
2.1. Cycle of vocational training (Elective educational components from the faculty / departmental Catalogues)			
VO 1	Educational component 1 Faculty catalogue	5	Exam
VO 2	Educational component 2 Faculty catalogue	5	Exam
VO 3	Educational component 3 Faculty catalogue	5	Exam
VO 4	Educational component 4 Faculty catalogue	4	Final tests
VO 5	Educational component 5 Faculty catalogue	4	Final tests
<b>The total amount of normative components:</b>		<b>67</b>	
<b>The total amount of elective components:</b>		<b>23</b>	
<b>Scope of educational components that provide the acquisition competencies defined by the HES:</b>		<b>45</b>	
<b>TOTAL VOLUME OF THE EDUCATIONAL PROGRAM</b>		<b>90</b>	

*Designations and abbreviations given in the table:*

*GC – normative course of the general training cycle*

*VC – normative course of the vocational training cycle*

*VO – elective course of the vocational training cycle*

*F-catalogue - a professional catalogue of elective courses of the training cycle*

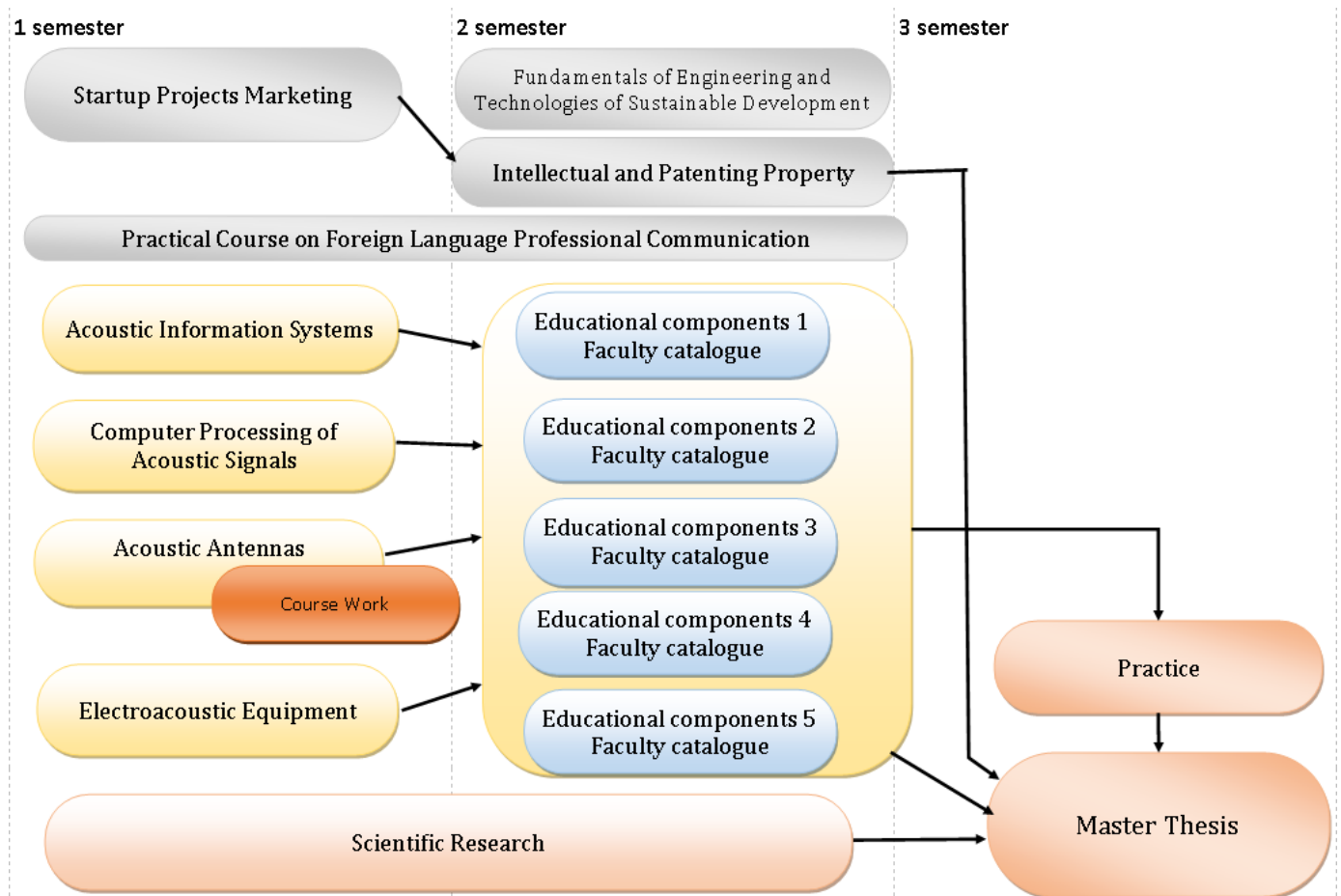
*HES - higher education standard of Ukraine*

### 3. CERTIFICATION OF HIGHER EDUCATION DEGREE APPLICANTS

Certification of applicants for higher education in the educational and professional program "Acoustic electronic systems and acoustic information processing technologies" speciality "Electronics" is carried out in the form of public defence (demonstration) of qualifying work – master's thesis and is followed by granting a standard master's degree document: Master of Electronics in the educational and professional program "Acoustic electronic systems and acoustic information processing technology".

Certification is carried out openly and publicly. The master's dissertation is checked for plagiarism and after the defence is stored in the repository of University's Scientific and Technical Library with open access.

### 4. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



## 5. MATRIX OF CORRESPONDENCE OF PROGRAM COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL PROGRAM

	GC1	GC2	GC3	GC4	VC1	VC2	VC3	VC4	VC5	VC6	VC7	VC8
CC 1				+	+		+	+	+	+		+
CC 2	+	+		+	+	+	+	+	+	+	+	+
CC 3			+							+		
CC 4	+									+	+	+
CC 5	+	+	+	+						+	+	+
CC 6	+	+		+						+	+	+
CC 7			+	+						+	+	+
CC 8			+	+						+	+	+
PC 1	+			+	+			+	+	+	+	+
PC 2	+			+						+		+
PC 3					+	+	+	+	+	+	+	+
PC 4					+	+	+	+	+	+	+	+
PC 5									+		+	+
PC 6	+			+	+	+	+	+	+	+	+	+
PC 7					+	+			+		+	+
PC 8		+		+	+				+	+	+	+
PC 9	+				+			+			+	+
PC 10					+	+	+	+	+			+
PC 11	+					+	+		+			+
PC 12					+	+	+	+	+	+	+	+

