

**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

**Electronic systems of multimedia
and Internet of Things technology**

EDUCATIONAL PROFESSIONAL PROGRAM

first (bachelor's) level of higher education

in specialty	171 "Electronics"
field of knowledge	17 "Electronics and telecommunications"
qualification	Bachelor's degree in Electronics

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

Kyiv - 2021

PREFACE

DEVELOPED by the project group:

Project team leader:

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Project team members:

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Smolenska Oleksandra Ihorivna, 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 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)

Proposals of interested persons are taken into account:

- increase the diversity of professionally-oriented disciplines (students) and maintain a rich fundamental component (employers).

The following changes have been made in the educational program:

- part of the disciplines was transferred to the blocks of elective disciplines, their content was modernized according to the profile 171 Electronics, an expanded list of disciplines was proposed to the cathedral F-Catalog.
- recommendations on updating educational programs and features of developing curricula for bachelors (taking into account the order of KPI named after Igor Sikorsky from 30.11.2020 № HOH/35/2020 "On improving educational programs of the first (bachelor's) level of higher education") and amended accordingly list of compulsory and optional educational components.

Coordinated with members of the scientific-methodical commission and the support group of the specialty 171 Electronics KPI them. Igor Sikorsky.

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

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1. Profile of the Educational Program in the Specialty 171 Electronics

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 the original language	Degree - bachelor Educational qualification - Bachelor of Electronics
The official title of the educational program	Electronic systems of multimedia and Internet of Things technology
Type of diploma and scope of educational program	Bachelor's degree, single, 240 credits, term of study 3 years 10 months
Availability of accreditation	Certificate of accreditation of the specialty НД 1192560, valid until 01.07.2023
Cycle / level of higher education	National Qualifications Framework of Ukraine - 6 level QF-EHEA – the first cycle EQF-LLL - 6 level
Prerequisites	- on the basis of complete general secondary education □ 240 ECTS credits; - on the basis of the degree "junior bachelor" (educational qualification level "junior specialist") it is possible to recalculate ECTS credits received within the previous educational program of junior bachelor (junior specialist): for specialties 17 "Electronics and Telecommunications" no more than 120 ECTS credits; in other specialties no more than 60 ECTS credits.
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 http://fel.kpi.ua/fel/index.php?option=com_content&view=article&id=77&Itemid=104&lang=uk
2 - The Purpose of the Educational Program	
Formation of theoretical and practical knowledge and skills, ways of thinking, views, values and other personal qualities in an electronics specialist, sufficient to solve complex specialized theoretical and practical tasks of development, design, production, installation, operation, maintenance, repair and modernization electronic devices and systems, as well as the formation of high adaptability of higher education seekers in the case of transformation of the labor market through interaction with employers and other stakeholders. The purpose of the educational program corresponds to the development strategy of Igor Sikorsky Kyiv Polytechnic Institute 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 (field of knowledge, specialty, specialization (if available))	<p><i>Objects of study and activity of electronics specialists</i> are hardware and software of electronics, microprocessor and microcontroller devices, devices and systems of power electronics and converting equipment, primary and secondary system transformations of information, analog and digital components, processes and systems of collection, storage, protection, processing, transmission of information and integration of these systems for automation of engineering tasks on the basis of modern computer equipment and software</p> <p><i>The purpose of training</i> is to acquire theoretical and practical knowledge and skills, abilities, ways of thinking, views, values and other personal qualities sufficient to solve complex specialized theoretical and practical tasks of development, design, production, installation, operation, maintenance, repair and modernization of electronic devices and systems.</p> <p><i>The theoretical content of the subject area</i> is formed by the concepts and principles of electrical engineering, physical foundations of electronics, information theory, signal processing, computer-integrated technologies.</p> <p><i>The graduate learns to apply and use</i> computer and microprocessor technology, measuring equipment, devices and systems of conversion technology, acoustoelectronics and power electronics, industrial controllers, other technical means of electronic devices and systems.</p>
Orientation of the educational program	Educational-professional
The main focus of the educational program and specialization	<p>General higher education in the field of electronics, in particular, its physical foundations, materials and technologies, electronic means of multimedia systems and the Internet of Things, analog and digital circuitry, converter and microprocessor technology, mastering additional fundamental and vocational disciplines, which together provides the necessary competencies for further professional activity.</p> <p>Aimed at developing the applicant's ability to identify and solve complex problems in the field of knowledge 17 Electronics and telecommunications within the specialty 171 Electronics. The program gives students the opportunity to freely choose disciplines according to the profile of the department.</p> <p>Keywords: Electronic multimedia systems; Electronic means of the Internet of Things, Microprocessor systems, Electronic means of reproduction of images and sound, Electronic means of digital cinema.</p>

Features of the program	<p>The internship must be at least 4 ECTS credits.</p> <p>The program is based on the requirements of the European Qualifications Framework for Lifelong Learning (EQF-LLL).</p> <p>The possibility of obtaining higher education in dual form.</p> <p>Participation of students in certificate programs.</p> <p>Students gain special knowledge in the field of modern electronic multimedia systems, digital cinema, hardware and software of digital television and technologies for creating and distributing audio-visual content, hardware and software of the Internet of Things and can work at Ukrainian enterprises in the relevant profile. To implement the program, it is planned to involve specialists and experts in the specialty 171 Electronics and related specialties, as well as representatives of employers and other stakeholders.</p>
4 – Suitability of Graduates for Employment and Further Study	
Suitability for employment	<p>Recommended professional titles of works according to the current edition of the National Classifier of Ukraine: Classifier of professions (DK 003: 2010):</p> <p>3114 Technicians in the field of electronics and telecommunications:</p> <ul style="list-style-type: none"> - telecommunication technician; - radar technician; - alarm technician; - design technician (electronics). - technician-technologist (electronics); <p>3119 Other technical specialists in the field of physical sciences and technology:</p> <ul style="list-style-type: none"> - dispatcher for the collection of navigation information; - laboratory assistant (electronics); - technician for preparation of technical documentation (electronics); - specialist in technical expertise (electronics). <p>3123 Controllers and regulators of industrial robots:</p> <ul style="list-style-type: none"> - debugging and testing technicians; - robot controller. <p>3131 Photographers and operators of image and sound recording equipment:</p> <ul style="list-style-type: none"> - video operator; - sound recording operator; - editor. <p>3132 Operators of radio and telecommunication equipment</p> <ul style="list-style-type: none"> - radio electronics; - sound recording technician. <p>3139 Other operators of optical and electronic equipment:</p> <ul style="list-style-type: none"> - technicians for diagnostic equipment; - technician-operator of electronic equipment; - Technician-technologist for the production of optical and optoelectronic devices. <p>3111 Laboratories and techniques related to chemical and physical research</p> <ul style="list-style-type: none"> - Technician-technologist (electronics). <p>3439 Other technicians in management:</p> <ul style="list-style-type: none"> - specialist in the organization of operation and repair (electronics)
Further training	<p>The right to continue education at the second (master's) level of higher education. Acquisition of additional qualifications in the system of postgraduate education.</p>
5 - Teaching and Assessment	
Teaching and studying	<p>Lectures, practical and seminar classes, computer workshops and laboratory works; course projects and works; technology of blended learning, practice and excursions; performance of qualification work</p>

Evaluation	Current control in the form of laboratory reports, presentations, written modular tests. Semester control in the form of written and oral examinations and defense of qualification work. Assessment of students' knowledge is provided 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 the application of theories and methods of electronics.
General Competences (GC)	
GC 1. Ability to apply knowledge in practical situations.	
GC 2. Knowledge and understanding of the subject area and understanding of professional activity.	
GC 3. Ability to communicate in the state language both orally and in writing	
GC 4. Ability to communicate in a foreign language.	
GC 5. Skills in the use of information and communication technologies.	
GC 6. Ability to learn and master modern knowledge.	
GC 7. Ability to search, process and analyze information from various sources.	
GC 8. Interpersonal skills.	
GC 9. Ability to work in a team.	
GC 10. Implementation of safe activities.	
GC 11. Ability to evaluate and ensure the quality of work performed.	
GC 12. Definiteness and perseverance in terms of tasks and responsibilities.	
GC 13. The ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.	
GC 14. Ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, techniques and technologies. active recreation and leading a healthy lifestyle.	
Special (professional, subject) Competencies (SC)	
SC1. Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices and systems of electronics.	
SC2. Ability to analyse of the subject area and regulatory documentation required for the design and application of devices, devices and electronics systems.	
SC3. Ability to integrate knowledge of fundamental sections of physics and chemistry to understand the processes of solid-state, functional and power electronics, electrical engineering.	
SC4. Ability to take into account social, environmental, ethical, economic and commercial considerations that affect the efficiency and results of engineering activities in the field of electronics.	
SC5. Ability to apply appropriate mathematical, scientific and technical methods, modern information technology and computer software, skills in working with computer networks, databases and Internet resources to solve engineering problems in the field of electronics.	
SC6. Ability to identify, classify, evaluate and describe processes in electronics devices, devices and systems using analytical methods, modeling tools, prototypes and experimental results.	
SC7. Ability to apply creative and innovative potential for the synthesis of engineering solutions and design of devices and electronics systems.	

SC8. Ability to solve engineering problems in the field of electronics taking into account all aspects of development, design, production, operation and modernization of electronic devices, devices and systems.	
SC9. Ability to determine and evaluate the characteristics and parameters of materials of electronic equipment, analog and digital electronic devices for the design of microprocessor and electronic systems.	
SC10. Ability to apply in practice industry standards and quality standards of functioning of devices and systems of electronics.	
SC11. Ability to monitor and diagnose the condition of equipment, use modern electronic components and hardware, perform maintenance, repair and maintenance of electronic devices and systems, install, configure and repair analog, digital and optical modules, develop and manufacture printed circuit boards, develop software for microcontrollers.	
SC12. Ability to develop technical and design documentation for electronic devices and devices of multimedia systems and the Internet of Things in accordance with industry regulations.	
SC13. Ability to apply knowledge of technological aspects of production, the latest electronic means, information and communication technologies in the field of electronic multimedia systems and the Internet of Things.	
SC14. Ability to protect information and configure telecommunication channels for the transmission of audiovisual information flows in electronic multimedia systems and signal exchange devices of the Internet of Things.	
7 - Program Learning Outcomes	
O1	Describe the principle of operation using scientific concepts, theories and methods and verify the results in the design and application of devices, devices and systems of electronics.
O2	Apply knowledge and understanding of differential and integral calculus, algebra, functional analysis of real and complex variables, vectors and matrices, vector calculus, differential equations in ordinary and partial derivatives, Fourier series, statistical analysis, information theory, numerical methods to solve theoretical and applied tasks of electronics.
O3	Find solutions to practical problems of electronics by applying appropriate models and theories of electrodynamics, analytical mechanics, electromagnetism, statistical physics, solid state physics.
O4	Evaluate the characteristics and parameters of electronic materials, understand the basics of solid-state electronics, electrical engineering, analog and digital circuitry, converter and microprocessor technology.
O5	Use information and communication technologies, applied and specialized programs to solve problems of design and debugging of electronic systems, demonstrate skills of programming, analysis and display of measurement and control results.
O6	Apply experimental skills (knowledge of experimental methods and experiments) to test hypotheses and study the phenomena of electronics, be able to use standard equipment, plan, make diagrams; analyze, model and critically evaluate the results.
O7	Analyze complex digital and analog information and measurement systems with advanced architecture of computer and telecommunication networks, taking into account the specification of selected technical means of electronics and relevant technical documentation.
O8	Identify and identify mathematical models of technological objects during the development of new complex electronic systems in the computer environment and the choice of the optimal solution.
O9	Design complex real-time systems and means of collecting and processing information, consistent with the specified information and software by using software for embedded microcontroller systems.

O10	Develop technical means for the construction and diagnosis of technical condition of electronic devices and systems, organize and conduct scheduled and unscheduled repairs, adjustment and reconfiguration of electronic equipment in accordance with current production requirements.
O11	Argue the legal framework for the implementation of electronic devices and systems; evaluate the benefits of engineering developments, their environmental friendliness and safety; to defend their own worldviews and beliefs in production or social activities.
O12	Use documentation related to professional activities, using modern technologies and office equipment; use English, including special terminology, to communicate with specialists, conduct literary research and read texts on technical and professional topics.
O13	Be able to learn new knowledge, advanced technologies and innovations, find new non-standard solutions and means of their implementation; meet the requirements of flexibility in overcoming obstacles and achieving goals, rational use and regulation of time, discipline, responsibility for their decisions and activities.
O14	Adhere to the norms of modern Ukrainian business and professional language.
O15	Demonstrate skills of independent and collective work, leadership qualities, organize work in a limited time with an emphasis on professional integrity.
O16	Apply understanding of the theory of stochastic processes, methods of statistical processing and data analysis in solving professional problems.
O17	Demonstrate skills of experimental research related to professional activities; to improve measurement methods; control the reliability of the obtained results; to systematize and analyze the data obtained experimentally.
O18	Apply methods of mathematical modeling and optimization of electronic systems for the development of automated and robotic production systems.
O19	Develop technical and design documentation for electronic devices and devices of multimedia systems and Internet of Things in accordance with industry regulations.
O 20	Apply knowledge of technological aspects of production, the latest electronic means, information and communication technologies in the field of electronic multimedia systems and the Internet of Things.
O 21	Protect information and configure telecommunication channels for the transmission of audiovisual information flows in electronic multimedia systems and the exchange of signals of Internet of Things devices.

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 distance learning platform Sikorsky, 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 Conditions), 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 Igor Sikorsky Kyiv Polytechnic Institute
9 - Academic Mobility	
National credit mobility	Possible subject to the conclusion of relevant agreements on national mobility and double diplomacy
International credit mobility	Possible subject to the conclusion of relevant agreements
Training of foreign applicants for higher education	Studying in general groups of Ukrainian students or in separate groups with teaching disciplines in English with the study of 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
1. REGULATORY Educational Components			
1.1. General Training Cycle			
GC1	Ukrainian for Specific Purposes	2	Final tests
GC2	History of Science and Technology	2	Final tests
GC3	Basics of a Healthy Lifestyle	3	Final tests
GC4	Foreign Language	6	Final tests
GC5	Foreign Language for Professional Purposes	6	Exam
GC6	Environmental Safety of Engineering Activity	2	Final tests
GC7	Introduction to Philosophy	2	Final tests
GC8	Business Law	2	Final tests
GC9	Economics and Production Organization	4	Final tests
GC10	Labor Safety and Civil Protection	4	Final tests
GC11	Mathematical Analysis	17	Exam
GC12	Analytic Geometry	4,5	Exam
GC13	Physics	12	Exam
GC14	Engineering and Computer Graphics	6	Exam
GC15	Informatics	8	Final tests
1.2. Cycle of Professional Training			
VC1	Measuring Technique	3,5	Final tests
VC2	Fundamentals of Analytical Mechanics and Theory of Oscillations	4	Final tests
VC3	Physical Fundamentals of Electronics	4	Exam
VC4	Data Transmission Networks	4,5	Final tests
VC5	Theory of Electrical Circuits	4	Final tests
VC6	Electrical Circuits and Signals of Multimedia Devices	4,5	Exam
VC7	Term Paper on Electrical Circuits and Signals of Multimedia Devices	1	Final tests
VC8	Fundamentals of Probabilistic Data Processing	5	Exam
VC9	Circuitry	6,5	Exam
VC10	Digital Circuitry of Multimedia Devices	6	Exam
VC11	Design and Production Technology of Information Registration Equipment	5	Exam
VC12	Technical Means of Cinematography	5	Exam
VC13	Course Project on Technical Means of Cinematography	1,5	Final tests
VC14	Fundamentals of Information Theory and Coding	5,5	Exam
VC15	Fundamentals of Radio and Television Broadcasting Systems	4,5	Final tests
VC16	Introduction to the Internet of Things	4	Final tests

Code n / a	Components of the educational program (academic disciplines, practices, qualification work)	Number of credits	Form of final control
1	2	3	4
VC17	Technical Electrodynamics and Propagation of Radio Waves	4	Exam
VC18	Term Paper on Technical Electrodynamics and Propagation of Radio Waves	1	Final tests
VC19	Wireless Audiovisual Content Distribution Networks	3,5	Exam
VC20	Term Paper on Wireless Audiovisual Content Distribution Networks	1	Final tests
VC21	Microprocessors and Microcontrollers in Information systems	4,5	Exam
VC22	Power Supply and Electromagnetic Compatibility of Multimedia Equipment	4,5	Exam
VC23	Pre-diploma Practice	6	Final tests
VC24	Diploma Project	6	Defense
2. SELECTIVE Educational Components			
2.1. General Training Cycle (Selective educational components from the general University Catalog)			
GO1	Educational components 1 University catalogue	2	Final tests
GO2	Educational components 2 University catalogue	2	Final tests
2.2. Vocational Training Cycle (Optional subjects from Faculty catalogue)			
VO1	Educational components 1 Faculty catalogue*	4	Final tests
VO2	Educational components 2 Faculty catalogue*	4	Final tests
VO3	Educational components 3 Faculty catalogue*	4	Final tests
VO4	Educational components 4 Faculty catalogue*	4	Final tests
VO5	Educational components 5 Faculty catalogue*	4	Final tests
VO6	Educational components 6 Faculty catalogue*	4	Final tests
VO7	Educational components 7 Faculty catalogue*	4	Final tests
VO8	Educational components 8 Faculty catalogue*	4	Final tests
VO9	Educational components 9 Faculty catalogue*	4	Final tests
VO10	Educational components 10 Faculty catalogue	4	Final tests
VO11	Educational components 11 Faculty catalogue	4	Final tests
VO12	Educational components 12 Faculty catalogue*	4	Final tests
VO13	Educational components 13 Faculty catalogue*	4	Final tests
VO14	Educational components 14 Faculty catalogue*	4	Final tests
The total amount of normative educational components:		180	
The total amount of selective educational components:		60	
The scope of educational components that ensure the acquisition of competencies defined by the SVO:		120	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		240	

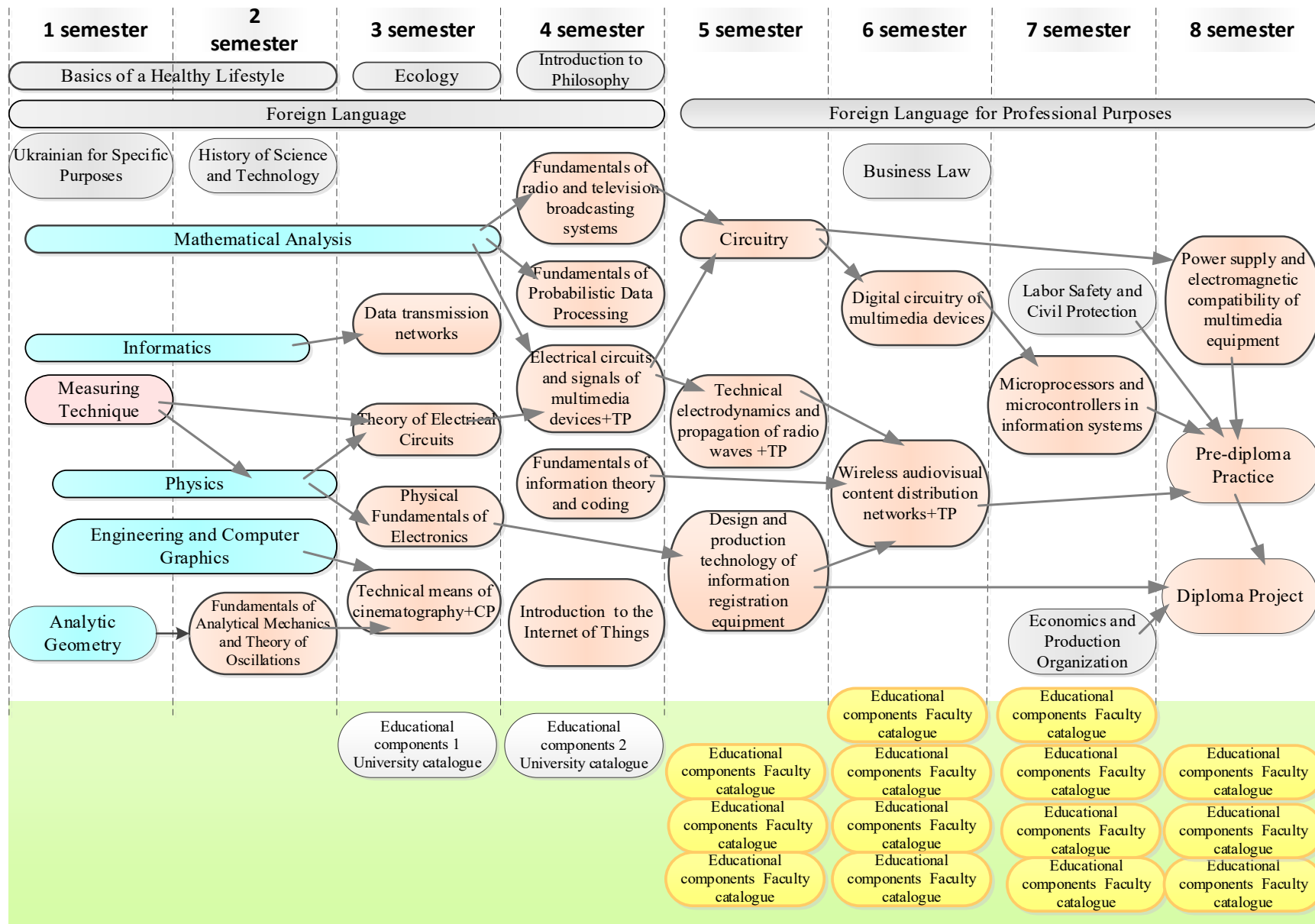
* SVO = Standard of higher education of Ukraine

3. Form of Certification of Applicants for higher education

Certification of applicants for higher education according to the educational program takes place in the form of public defense of the qualification work in the form of a diploma project or diploma work. Based on the results of successful defense of the qualification work, the applicant receives a standard document on the award of a bachelor's degree and a bachelor's degree in electronics under the educational program "Electronic multimedia systems and the Internet of Things."

Certification should be open and public. Qualification work is checked for borrowings (plagiarism). Qualification work is published before the defense on the official website of the university, its department or in the university depository. Publication of qualification works containing information with limited access must be carried out in accordance with the requirements of current legislation.

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	GC5	GC6	GC7	GC8	GC9	GC10	GC11	GC12	GC13	GC14	GC15	VC1	VC2	VC3	VC4	VC5	VC6	VC7	VC8	VC9	VC10	VC11	VC12	VC13	VC14	VC15	VC16	VC17	VC18	VC19	VC20	VC21	VC22	VC23	VC24			
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SC1															+	+	+				+	+					+			+							+		+	+		
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6. MATRIX OF PROVIDING PROGRAM LEARNING OUTCOMES WITH RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAM

	GC1	GC2	GC3	GC4	GC5	GC6	GC7	GC8	GC9	GC10	GC11	GC12	GC13	GC14	GC15	VC1	VC2	VC3	VC4	VC5	VC6	VC7	VC8	VC9	VC10	VC11	VC12	VC13	VC14	VC15	VC16	VC17	VC18	VC19	VC20	VC21	VC22	VC23	VC24			
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