**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**
**National Technical University of Ukraine**
**"Igor Sikorsky Kyiv Polytechnic Institute"**

APPROVED

by Head of Academic Council
Igor Sikorsky Kyiv Polytechnic Institute

_____ Mykhaylo ILCHENKO

«__3_»_____15_____2021 p.

# EDUCATIONAL AND SCIENTIFIC PROGRAM

## Electronic Components and Systems

| | |
|---|---|
| **Level of higher education** | **second (master's) level** |
| **Speciality** | **171 Electronics** |
| **Qualification** | **Master in Electronics** |

APPROVED by Academic Council of university

protocol No HOH/89/2021
from «19»__04__2021

Igor Sikorsky Kyiv Polytechnic Institute
Kyiv – 2021

# PREFACE

## DEVELOPED by project group:

Guarantor of educational program
Ievgen VERBITSKY
PhD, Assistant Professor of Department of Electronic Devices and Systems _____

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PhD, Assistant Professor of Department of Electronic Devices and Systems _____

## APPROVED:

by Scientific-Methodological Commission of Igor Sikorsky Kyiv Polytechnic Institute by specialty 171 Electronics

Head of Scientific-Methodological Commission _____ Iuliia YAMNENKO
(protocol No _4_ from «_02_»___02__2021)

by Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute
Head of Methodological Council _____ Yuriy YAKYMENKO
(protocol No _6__ from «_25_»__02___2021)

## TAKEN INTO ACCOUNT:

1. Methodological recommendation of Sector of Higher Education of Scientific-Methodological Council of 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. Project of the Standard of Higher Education by specialty 171 Electronics for Master degree https://mon.gov.ua/storage/app/media/vyshcha/standarty/2020/05/2020-zatverd-standart-171-m.pdf
3. Recommendations and propositions of stakeholders by the results of public discussion:

• scientific and pedagogical staff of Department of Electronic Devices and Systems
• students who are studying by educational program
• specialists in the field of electronics and telecommunications (references and support letters are attached).

## CONTENT

# 1. PROFILE OF EDUCATIONAL PROGRAM

| 1 – General characteristics | |
|---|---|
| Full name of university and Institute/Faculty | National Technical University of Ukraine ”Igor Sikorsky Kyiv Polytechnic Institute”, Faculty of Electronics |
| Level of higher education and qualification | Level of higher education – Master<br>Qualification – Master in Electronics |
| Field of Study | 17 Electronics and Telecommunications |
| Speciality | 171 Electronics |
| Official name of educational program | Electronic Components and Systems |
| Type of diploma | Master’s diploma |
| Duration of study | 2 academic years (1 year 9 months) |
| Volume of educational program | 120 ECTS credits<br>Practice should be not less than 4 ECTS credits<br>Minimum 50% of educational program should be directed to obtaining general and special competences by specialty that are defined by Standard of higher education |
| Cycle/level of higher education | National Frame of Qualifications of Ukraine – level 8<br>FQ-EHEA – cycle 4<br>EQF-LLL – level 9 |
| Presence of accreditation | Yes |
| Pre-requisites | Existing Bachelor level |
| Forms of study | Full-time, part-time, distant, dual |
| Languages of study | Ukrainian, English |
| Expiring date | Till next revision |
| Link to constant placement of educational program | http://eds.kpi.ua/?page_id=5040 |
| **2 – Goals of study** | |
| Preparation of the specialists able to develop of new and to use existing scientific methods, technologies, devices and systems of electronics in academic institutions and leading enterprises | |

## 3 – Description of subject area

**Object of activity** – physical processes and phenomena, algorithms and systems of control, topological and software solutions that create the basis of functioning of microprocessor and computer, informational and power converting electronic systems, their use for solving the urgent specialized tasks and practical problems of professional activity in the field of electronics.

**Goals of study** – obtaining the competences for successful professional activity: development, analysis and use of technologies, materials and devices of electronics; design, manufacturing, testing, mounting and installation, exploitation, renewing and modernization of electronic equipment on the base of modern circuit solutions.

**Theoretical content** of subject area is based on fundamental principles of designing of modern electronic systems, control systems, methods of modeling of objects and processes and their optimization, modern computer and informational technologies, instruments of engineering and scientific research, theory of planning and experiment conducting.

**Student studies** to use **methods and technologies** of: measurement and modeling of characteristics of electrotechnical materials, electronic devices and systems; planning of experiments and processing of their results by use of **instruments and equipment**: computer and microprocessor technique, software of general and special use for designing the electronic circuits, developing and supporting the constructor documentation, choice of topology solutions during the creation of electronic devices and system, developing the software.

## 4 – Main focus of educational program

Specialized education in the field of electronics, in particular, industrial and power electronics, analogue and digital circuit design, converting and microprocessor technique, electronic components and systems, mathematical modeling and optimization with the obtaining research skills for realization of scientific and professional carreer.

## 5 – Program peculiarities

Educational program includes disciplines of Master professional program and additional disciplines that deepens knowledge by special chapters of fundamental and professional-oriented disciplines and provide design, constructing and technological competences for further engineering and research activity.

Educational program provides obtaining research and professional qualification in the field of electronics and possibility for successful employment in academic institutions and professional enterprises by corresponding direction. Students have a possibility to take part in academic mobility programs, to study by double diploma programs with Technical University of Dresden and South Korea Institute of Science and Technology.

## 6 – Key words

Power electronics, industrial electronics, analogue circuit design, digital circuit design, mathematical modeling, optimization, electronic systems, electronic technological equipment

## 7 – Academic rights of graduates

Master in Electronics has a right to continue study on third (PhD) level of higher education and to obtain additional qualifications in the system of education for adults.

## 8 – Employment

2143 Professionals in the field of electronics

- Engineer on relay protection and electrical automation
- Engineer of converting complex

2144 Professionals in the field of electronics and telecommunication

- Engineer in the field of electronics and telecommunication
- Engineer on sound recording
- Engineer on electronics
- Engineer on electronic systems of manufacturing of non-traditional and renewable energy sources
- Engineer on design (electronics)

2149 Professionals in other fields of engineering

- Engineer
- Engineer on control of gas accounting systems
- Engineer on tune-up and testing (in electronics)
- Engineer on standards and quality
- Engineer on exploitation and repair (in electronics)

## 9 – Teaching and study

- Lections, practical and seminar lessons, computer practicum, laboratory and calculation works, practices, interactive workshops – in auditorium, distant or combined format;
- Auditorium lessons with involvement of professionals in the field of electronics, including the study at the territory of partner enterprises;
- Participation in scientific and technical international and inter-disciplinary conferences, seminars, projects, trainings;
- Own work with the use of methodological and scientific information sources;
- Participation in work groups on developing the research projects;
- Consultations with scientific and pedagogical staff.

The study is finished by writing and public defense of qualification thesis – Master dissertation.

## 10 – Estimation

To estimate students' knowledge the rating system, oral and written exams, testing are used.

## 11 – Resource base for educational program realization

| | |
|---|---|
| Staff base | According to staff demands concerning the providing of educational activity for corresponding level of higher education (Annex 2 to License conditions approved by Decree of Cabinet of Ukraine from 30.12.2015, No. 1187) |
| Material and technical base | According to technological demands on material and technical base of educational activity for corresponding level of higher education ( Відповідно до технологічних вимог щодо матеріально-технічного забезпечення освітньої діяльності відповідного рівня ВО (Annex 3 to License conditions approved by Decree of Cabinet of Ukraine from 30.12.2015, No. 1187) |
| Informational and methodological base | According to technological demands on material and technical base of educational activity for corresponding level of higher education ( Відповідно до технологічних вимог щодо матеріально-технічного забезпечення освітньої діяльності відповідного рівня ВО (Annex 5 to License conditions approved by Decree of Cabinet of Ukraine from 30.12.2015, No. 1187) |

| 12 – Academic mobility | |
|---|---|
| National credit mobility | Possible, subject to corresponding agreements between Igor Sikorsky Kyiv Polytechnic Institute and Ukrainian universities |
| International credit mobility | Realized on the base of agreements about international academic mobility (Erasmus+ K2).<br>Program of double diploma with Technical University of Dresden and South Korea Institute of Science and Technology. |
| Study of foreign students | Possibility to teach in English, subject to corresponding agreements between Igor Sikorsky Kyiv Polytechnic Institute and foreign universities. |

## 2. LIST OF COMPETENCIES AND PROGRAM RESULTS OF STUDY OF HIGHER EDUCATION APPLICANT

| Integral competence | |
|---|---|
| Ability to solve complex specialized tasks and practical problems of professional activity in the field of electronics and / or in the learning process, which involves research and / or innovation in the field of electronics and characterized by complexity and uncertainty of conditions and requirements. | |
| **General competencies (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 a foreign language |
| GC 4 | Ability to perform 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 | Interpersonal skills |
| 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 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 power, information, control and multimedia systems |
| 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 systems |
| PC 5 | Ability to ensure the efficiency and quality of measurements in electronic 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 systems |
| PC 8 | Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic 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 present research results to specialists and non-specialists, to lead a discussion and argue own position |
| PC 11 | Ability to plan and perform research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations |
| **Program results of education** | |
| R1 | Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia |
| R2 | Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry |
| R3 | 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 |
| R4 | Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources |
| R5 | Ensure energy and economic efficiency of development, production and operation of electronic equipment |
| R6 | 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 systems |
| R7 | 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 |
| R8 | 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 |
| R9 | Coordinate the work of teams of performers in the field of research, design, development, analysis, calculation, modeling, production and testing of electronic devices and systems |
| R10 | Choose the best research methods, modify, adapt and develop new methods |
| R11 | Analyze technical and economic indicators, reliability, ergonomics, patent purity, market requirements, investment climate and compliance of design solutions, research and development with certain goals and norms of the legislation of Ukraine |
| R12 | 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 |
| R13 | Organize and manage research, innovation and investment activities, business projects and production processes taking into account technical, technological and economic factors |
| R14 | Investigate processes in electronic systems using modern experimental methods and equipment, computer modeling methods, perform statistical processing and analysis of experimental results and calculations |
| R15 | Participate in the development and implementation of projects of international scientific cooperation and academic mobility |

## 3. DISTRIBUTION OF CONTENT, SEQUENCE AND INTERCONNECTION OF EDUCATIONAL COMPONENTS

- The educational component of the program provides the following cycles of training:

- general training cycle;

- vocational training cycle;

- optional educational components of general training cycle (optional disciplines from the GU-Catalog - general university catalog);

- optional educational components of vocational training cycle (optional disciplines from the F-catalog - faculty / departmental catalog).

The institution of higher education has the right to change the names of academic disciplines in the prescribed manner.

3.1. More than 50% of the educational program is aimed at providing general and special (professional) competencies in the specialty, which are determined by the standard of higher education.

The total amount of optional disciplines is at least 25% of the total amount of the educational program in ECTS credits.

3.2. The distribution of the content of the educational program is given in table I.

3.3. In table II are listed the disciplines with their distribution by training cycles.

Table I – Distribution of the content of the educational part of training

| Training cycle | ECTS Credits | Share of the total, % |
|---|---|---|
| General training cycle | 22,5 | 18,7 |
| Vocational training cycle | 97,5 | 81,3 |
| - including the optional educational components | 30 | 25 |
| TOTAL | 120 | 100 |

Table II – List of educational components of the educational part of training

| Code | Educational components | ECTS Credits | Form of final control |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| **1. Compulsory educational components** | | | |
| **1.1. General training cycle** | | | |
| GC1 | Intellectual and Patenting Property | 3 | Final test |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| GC2 | Foundations of sustainable development (Основи сталого розвитку) | 2 | Final test |
| GC3 | Practice on Foreign Language Scientific Communication | 4,5 | Final test |
| GC4 | Startup Projects Marketing | 3 | Final test |
| GC5 | Pedagogical Excellence | 2 | Final test |
| GC6 | Mathematical Optimization Methods | 4 | Exam |
| GC7 | Mathematical Modeling of Systems and Processes | 4 | Exam |
| **1.2. Vocational training cycle** | | | |
| VC1 | Electronic Systems for Operation and Control | 5 | Exam |
| VC2 | Course Project in Electronic Systems for Operation and Control | 1,5 | Final test |
| VC3 | Fundamentals of Automatic Control Theory | 5 | Exam |
| VC4 | Power Electronic Systems | 6 | Exam |
| VC5 | Power Supply Systems of Electronic Equipment | 5 | Final test |
| VC6 | Supplementary Topics of Information Electronics | 6 | Exam |
| VC7 | Course Project inSupplementary Topics of Information Electronics | 1,5 | Final test |
| VC8 | Scientific Research | 7,5 | Final test |
| VC9 | Scientific and Research Practice | 9 | Final test |
| VC10 | Master Thesis | 21 | – |
| **2. Optional educational components** | | | |
| **2.1. Vocational training cycle (Optional subjetcs from Faculty catalogue)** | | | |
| VO1 | Educational components 1 Faculty catalogue | 5 | Exam |
| VO2 | Educational components 2 Faculty catalogue | 4,5 | Final test |
| VO3 | Educational components 3 Faculty catalogue | 4 | Exam |
| VO4 | Educational components 4 Faculty catalogue | 5 | Exam |
| VO5 | Educational components 5 Faculty catalogue | 4 | Final test |
| VO6 | Educational components 6 Faculty catalogue | 3,5 | Final test |
| VO7 | Educational components 7 Faculty catalogue | 4 | Final test |
| TOTAL IN **General training cycle**: | | 22,5 | |
| TOTAL IN **Vocational training cycle**: | | 97,5 | |
| including the **optional educational components**: | | 30 | |
| TOTAL IN NORMATIVE educational components: | | 90 | |
| TOTAL IN OPTIONAL educational components: | | 30 | |
| **TOTAL VOLUME OF THE EDUCATIONAL PROGRAM** | | **120** | |

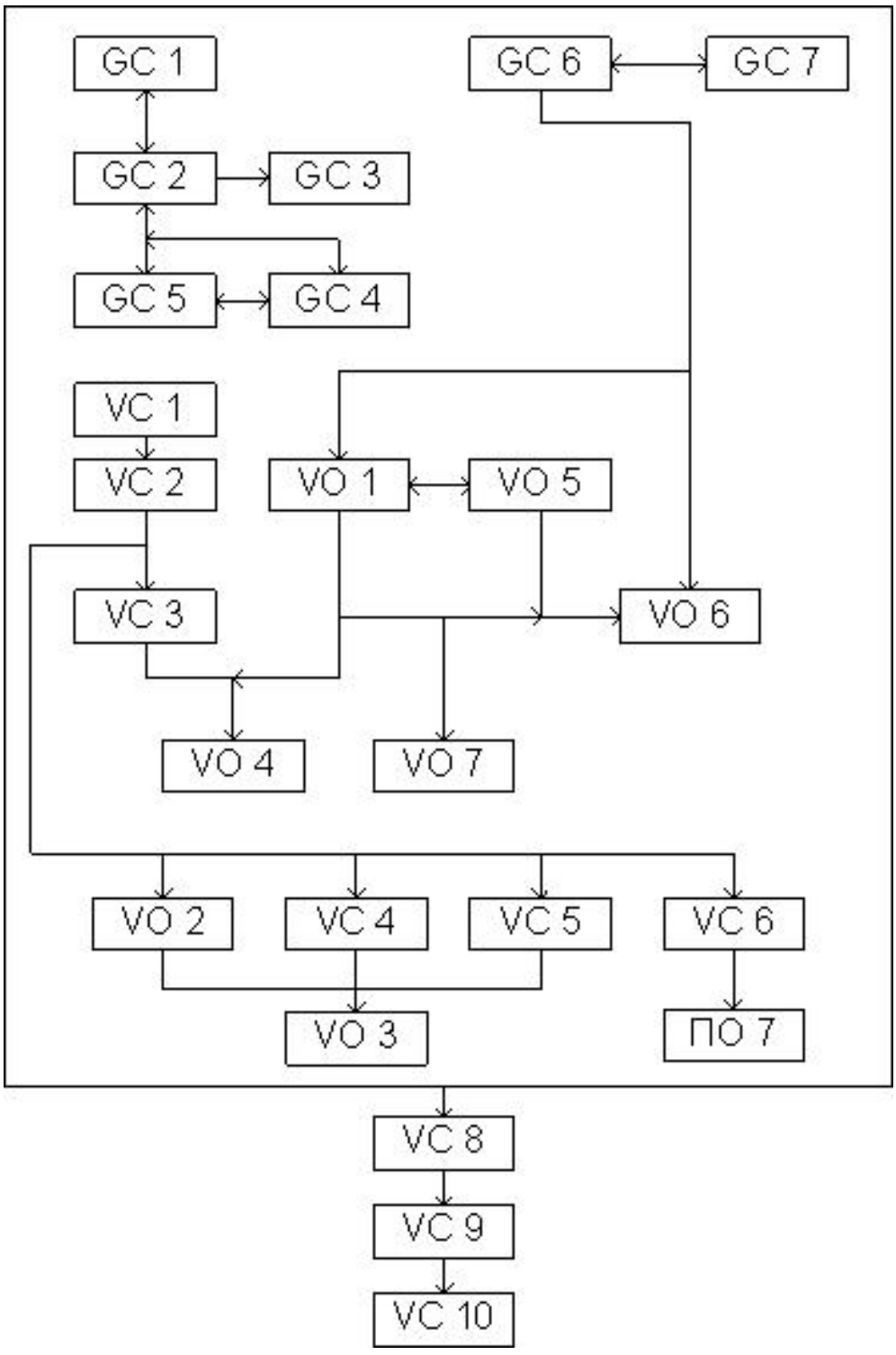
*Designations and abbreviations are given in the table:*

GC – Compulsory educational component of General training cycle

VC – Compulsory educational component of Vocational training cycle

VO – Optional educational components of Vocational training cycle

3.4. Structural and logical scheme of the educational program



## 4. MATRIX OF CONFORMITY OF PROGRAM COMPETENCES TO THE COMPONENTS OF THE EDUCATIONAL PROGRAM

| | GC 1 | GC 2 | GC 3 | GC 4 | GC 5 | GC 6 | GC 7 | VC 1 | VC 2 | VC 3 | VC 4 | VC 5 | VC 6 | VC 7 | VC 8 | VC 9 | VC 10 | VO 1 | VO 2 | VO 3 | VO 4 | VO 5 | VO 6 | VO 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 | | | | | | | + | | | | | | + | | + | | | | | | | | + | |

## 5. MATRIX OF PROVIDING PROGRAM LEARNING RESULTS BY RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAM

| | GC 1 | GC 2 | GC 3 | GC 4 | GC 5 | GC 6 | GC 7 | VC 1 | VC 2 | VC 3 | VC 4 | VC 5 | VC 6 | VC 7 | VC 8 | VC 9 | VC 10 | VO 1 | VO 2 | VO 3 | VO 4 | VO 5 | VO 6 | VO 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R 1 | | | + | | | | | + | | | + | + | + | | | + | | | + | + | + | | | |
| R 2 | | | | | | | | + | + | + | + | | | | | | + | | + | | | | | |
| R 3 | + | | | + | + | + | | | | | | | | | + | + | + | | | | | | | |
| R 4 | | + | + | | | | | + | + | + | + | + | + | + | + | | | + | + | + | + | + | | |
| R 5 | | + | | + | | | | + | | + | + | + | | | | | | | | | | | + | + |
| R 6 | + | | | | + | | + | | + | | | | | + | + | + | | | | + | | | | |
| R 7 | + | | | | | | | | | | | | | | + | | + | | | | | | | |
| R 8 | | | | | | | | | | | + | | | | + | | | | | + | + | | | |
| R 9 | | | | + | | | | | | | | | | | + | | | | | | | | | |
| R 10 | + | | | | | + | | + | | + | | | | | + | | | | | | | | | |
| R 11 | + | | | + | | | | | | | | | | | + | | | | | | | | | |
| R 12 | | | | + | | | | + | | + | + | | | | | | | | | + | + | | + | + |
| R 13 | | | + | + | | | | | | | | | | | | + | | | | | + | | | |
| R 14 | | | | | | + | + | | | | | + | + | | | + | + | | | | | | + | + |
| R 15 | | | | | + | | | | | | | | | | | + | + | | | | | | | |

## 6. FORM OF FINAL ATTESTATION OF STUDENTS

The final attestation of students in the educational program is conducted in the form of public defense of the Master Thesis and ends with the issuance of a standard document on awarding a master's degree and qualification “Master in Electronics” in the educational program "Electronic Components and Systems".

Final attestation is carried out openly and publicly. Master Thesis checked for plagiarism.

## 7. INTERNAL QUALITY ASSURANCE SYSTEM OF HIGHER EDUCATION

In the Igor Sikorsky Kyiv Polytechnic Institute functioning system of higher education quality education and quality of higher education (internal quality assurance system), which provides for such procedures and measures:

1) defining the principles and procedures for ensuring the quality of higher education;
2) monitoring and periodic review of educational programs;
3) annual evaluation of students, research and teaching staff of higher education institutions and regular publication of the results of such evaluations on the official website of the Higher Education Institution, on information stands and in any other way;
4) providing advanced training of pedagogical, scientific and scientific-pedagogical workers;
5) ensuring the availability of the necessary resources for the organization of the educational process, including independent work of students, for each educational program;
6) ensuring the availability of information systems for effective management of the educational process;
7) ensuring publicity of information about educational programs, higher education degrees and qualifications;
8) ensuring compliance with academic integrity by employees of higher education institutions and students, including the establishment and operation of an effective system for the prevention and detection of academic plagiarism;
9) other procedures and measures.

The system of providing higher education institutions with the quality of educational activities and the quality of higher education (internal quality assurance system) is assessed by the National Agency for Quality Assurance in Higher Education or its independent accredited quality assessment and quality assurance institutions for compliance with the requirements of the assurance system. quality of higher education, approved by the National Agency for Quality

Assurance in Higher Education, and international standards and recommendations for quality assurance in higher education.

## 8. LIST OF REGULATORY DOCUMENTS ON WHICH THE EDUCATIONAL PROGRAM IS BASED

**Official documents:**

1. ESG 2015 (Standards and Guidelines for Quality Assurance in the European Higher Education Area) – https://ihed.org.ua/wp-content/uploads/2018/10/04_2016_ESG_2015.pdf
2. EQF 2017 (European Qualifications Framework) – https://publications.europa.eu/en/publication-detail/-/publication/ceead970-518f-11e7-a5ca-01aa75ed71a1/language-en; https://ec.europa.eu/ploteus/content/descriptors-page
3. QF EHEA 2018 (The framework of qualifications for the european higher Education area) – http://www.ehea.info/Upload/document/ministerial_declarations/EHEAParis2018_Communique_AppendixIII_952778.pdf
4. ISCED (International Standard Classification of Education) 2011 – http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf ; http://uis.unesco.org/en/topic/international-standardclassification-education-isced
5. ISCED-F (International standard classification of education, Fields of education and training) 2013 – http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-fields-of-education-and-training-2013-detailed-field-descriptions-2015-en.pdf
6. Law "On Higher Education"– https://zakon.rada.gov.ua/laws/show/1556-18.
7. Law "On Education"– https://zakon.rada.gov.ua/laws/show/2145-19.
8. National Classifier of Ukraine: Classifier of professions ДК 003:2010. – https://zakon.rada.gov.ua/rada/show/va327609-10
9. National qualifications framework, 2019 – https://zakon.rada.gov.ua/laws/show/1341-2011-%D0%BF.
10. List of fields of education and training and specialties 2015 – https://zakon.rada.gov.ua/laws/show/266-2015-%D0%BF.
11. Decree of the President of Ukraine "Issues of European and Euro-Atlantic integration" of April 20, 2019 № 155/2019 – https://www.president.gov.ua/documents/1552019-26586

12. Resolution of the Cabinet of Ministers of Ukraine “On approval of the Procedure for training students for the degree of Doctor of Philosophy and Doctor of Science in higher educational institutions (scientific institutions)” № 261 of March 23, 2016 https://zakon.rada.gov.ua/laws/show/261-2016-%D0%BF

13. Order of the Ministry of Education and Science of Ukraine dated "01" June 2016 № 600 (as amended by the order of the Ministry of Education and Science of Ukraine dated 01.10.2019 № 1254) "On approval and implementation of Guidelines for the development of standards of higher education". http://edu-mns.org.ua/img/news/8635/NakMON_1254_19.pdf

**Other recommended sources:**

1. Tuning Educational Structures in Europe. http://www.unideusto.org/tuningeu/

2. National Glossary: Higher Education, 2014 – http://erasmusplus.org.ua/korysna-informatsiia/korysni-materialy/category/3-materialynatsionalnoi-komandy-ekspertiv-shchodo-zaprovadzhennia-instrumentiv-bolonskohoprotsesu.html?start=80

3. Rashkevych Yu.M. The Bologna Process and a New Paradigm of Higher Education: Monograph – https://erasmusplus.org.ua/korysna-informatsiia/korysni-materialy/category/3-materialy-natsionalnoi-komandy-ekspertiv-shchodo-zaprovadzhennia-instrumentiv-bolonskoho-protsesu.html?download=82:bolonskyi-protses-nova-paradyhma-vyshchoi-osvity-yu-rashkevych

4. Development of educational programs: methodical recommendations – http://erasmusplus.org.ua/korysna-informatsiia/korysni-materialy/category/3-materialynatsionalnoi-komandy-ekspertiv-shchodo-zaprovadzhennia-instrumentiv-bolonskohoprotsesu.html?start=80