MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
«Igor Sikorsky Kyiv Polytechnic Institute»

APPROVED:
Academic Council of Igor Sikorsky Kyiv Polytechnic Institute
(Protocol № 5 dated September 7, 2020)
Chairman of the Academic Council
Mykhailo ILCHENKO

Control systems of flight vehicles and complexes engineering

EDUCATIONAL AND SCIENTIFIC PROGRAM

third level of higher education

specialty	**173 Avionics**
field of knowledge	**17 Electronics and telecommunications**
qualification	**Doctor of Philosophy in Avionics**

Put into effect by order of the rector
Igor Sikorsky Kyiv Polytechnic Institute
from 17.09.2020 № 1/282

Kyiv – 2020

PREAMBLE

DEVELOPED by the project team:

The project team chairman

Oleksandr Zbrutskyi, Doctor of Technical Sciences, Professor, Head of the Department of Aircraft Control Systems

The project team members:

Mykola Chernjak, Ph.D., Associate Professor, Associate Professor of the Department of Aircraft Control Systems

Vitalyi Burnashev, Ph.D., Associate Professor, Associate Professor of the Department of Aircraft Control Systems

Sergyi Ponomarenko, Ph.D., Senior Researcher, Associate Professor of the Department of Aircraft Control Systems

AGREED:

Scientific and methodical commission of Igor Sikorsky Kyiv Polytechnic Institute on specialty 173 "Avionics":

Head SMC 173 **Oleksandr ZBRUTSKYI**
(protocol № 2 from 22.06.2020)

Head of the Methodical Council **Yuriy YAKYMENKO**
(protocol № 1 from 03.09.2020)

INCLUDED:

Professional expertise was conducted by:
Director - Chief Designer SE SDB "Arsenal" M.I. Likholit

Director of the Institute of Space Research of NASU and SSAU O.P.Fedorov

The educational and scientific program was discussed after receiving all the wishes and suggestions from students and graduates and approved at a meeting of the Department of Aircraft Control Systems (protocol № 9 from 10.06.2020).

CONTENT

1.PROFILE OF THE EDUCATIONAL PROGRAM on the specialty 173 "Avionics"

1 - General information	
Full name of HEI and institute / faculty	NATIONAL TECHNICAL UNIVERSITY OF UKRAINE «Igor Sikorsky Kyiv Polytechnic Institute», Institute of Aerospace Technology
Degree of higher education and title of qualification in the original language	Degree of HE – Doctor of Philosophy Educational qualification – Doctor of Philosophy in Avionics
The official name of the EP	Control systems of flight vehicles and complexes engineering
Type of diploma and scope of EP	Doctor of Philosophy Diploma Normative training period 4 years Educational component 40 ECTS credits The scientific component involves conducting your own research and registration of its results in the form of a dissertation
Availability of accreditation	The program is accredited for the first time
Cycle / level of HE	NQF of Ukraine – level 8 QF-EHEA – the third cycle EQF-LLL – level 8
Prerequisites	The presence of a master degree
Language (s) of teaching	Ukrainian
Validity of the EP	Until the next accreditation
Internet address of the permanent placement of the educational program	https://skla.kpi.ua/ua/study/osvitni-prohramy/ Section "Training – Educational programs" https://osvita.kpi.ua/ Section "Educational programs"

2- The purpose of the educational program
Training of highly qualified, competitive, integrated in the European and world scientific and technical space professionals with a degree of Doctor of Philosophy in Electronics and Telecommunications, specialty 173 "Avionics", able to solve complex problems in the field of avionics, aircraft control systems and complexes. research and innovation, organizational and managerial, pedagogical activities in the field of avionics and related fields in higher education institutions, through the internationalization of the educational process in terms of sustainable innovative scientific and technical development. Implemented through: - harmonious and multidimensional education of future highly qualified technical professionals, able to comprehensively and systematically analyze problems in avionics and related fields, realizing the nature of surrounding processes and phenomena, to provide and implement cultural communication; - formation of high adaptability of higher education seekers in the conditions of labor market transformation through interaction with employers and other stakeholders. The purpose of the educational program corresponds to the strategy of development of Igor Sikorsky Kyiv Polytechnic Institute for 2020-2025 ", it is based on the vision and mission of Igor Sikorsky Kyiv Polytechnic Institute. The vision is the creating all conditions for the training of highly skilled professionals able to produce modern scientific knowledge and innovative technologies for the good of humanity and to provide the deserving place for Ukraine in world cooperation. The mission is to make a significant contribution to ensuring the sustainable development of society by internationalization and integration of education, the latest scientific researches and innovative developments. To create conditions for all-round professional, intellectual, social and creative development of personality on the greatest levels of perfection in an educationally-scientific environment.

3 - Characteristics of the educational program	
Subject area	*Object of activity*: Processes and phenomena of avionics, control systems of flight vehicles and complexes engineering. *Learning Objectives*: to train avionics professionals capable of solving complex problems of professional and / or research and innovation activities in the field of avionics. *Theoretical content of the subject area*: concepts, approaches, principles of research and design of avionics systems, aircraft avionics; modern theory of automatic control; creation of hardware and software-algorithmic means to increase the accuracy, reliability, survivability of systems and avionics. *Methods, techniques and technologies*: analytical, numerical and experimental studies of avionics systems, methods and technologies of automated development of on-board aircraft avionics and aircraft control systems, information transmission, processing and display systems. *Tools and equipment*: stands and simulation software for modeling avionics systems; devices and systems of automatic control, computing means, microprocessor control systems of onboard and ground equipment.
Orientation EP	Educational and scientific
The main focus of the EP	Acquisition of in-depth knowledge in the specialty and professional training in the field of development, design, research of devices and control systems of aviation, rocket and outer space technologies. It is based on innovative ideas, concepts, paradigms, principles, theories in avionics and other results of modern scientific research. Keywords: control systems, avionics.
Features of EP	The program focuses on conducting research work according to the research topics of supervisors. The high level of the research part of the training is provided by the scientific school "Gyroscopes and navigation systems". The implementation of the program provides for involvement of practitioners, industry experts, representatives of employers in classroom studies.
4 - Suitability of graduates for employment and further study	
Suitability for employment	According to the National Classifier of Ukraine: Classifier of professions (SC 003: 2010), including: 2149.1 Junior Research Fellow in Avionics 2149.1 Avionics Researcher 2149.1 Senior researcher in Avionics
Further training	Continuing education in doctoral studies and / or participation in postdoctoral programs
5 - Teaching and assessment	
Teaching and learning	Lectures, practical and seminar classes, doctoral dissertation, blended learning technology, holding regular conferences, seminars, colloquia, access to the use of laboratories, equipment, etc.

Evaluation	Rating system of assessment, oral and written exams, tests, testing, etc., defense of a dissertation on a research topic
6 - Program competencies	
Integral competence	Ability to solve complex problems in the field of development and analytical-experimental research of avionics devices and systems of aircraft and complexes, and to carry out research and innovation activities, which involves a deep rethinking of existing knowledge and the creation of holistic knowledge and professional practice in the field of avionics
General Competences (GC)	
GC01	Ability to abstract thinking, analysis and synthesis.
GC02	Ability to search, process and analyze information from various sources.
GC03	Ability to work in an international context.
GC04	Ability to initiate and implement research and innovation projects, manage projects, research activities of the department, organize the development of creative initiative of the team.
GC05	Ability to provide continuous self-development and self-improvement
GC06	Ability to use modern methods and technologies of foreign language scientific communication .
GC07	Ability to qualitatively present the results of scientific research.
GC08	Must have a systematic scientific worldview and general cultural outlook.
Professional competencies of the specialty (PC)	
PC01	Ability to perform original research, to achieve scientific results that create new knowledge in the field of avionics and related interdisciplinary areas and can be published in leading scientific publications in avionics and related fields.
PC02	Ability to use modern information technologies, databases and other electronic resources, specialized software in scientific and educational activities.
PC03	Ability to identify, pose and solve problems of a research nature in the field of avionics, evaluate and ensure the quality of research.
PC04	Ability to develop models, methods and algorithms to control aviation, space, robotics and other moving automatic or automated objects.
PC05	Ability to develop models, methods and technologies for diagnosing, maintenance and repair of avionics systems and complexes.
7 - Program results of learning	
KNOWLEDGE	
KN 1	Advanced conceptual and methodological knowledge in avionics and on the borders of subject areas, sufficient for scientific and applied research at the level of the latest world achievements in the relevant field, gaining new knowledge and / or innovation.
KN 2	Professional terminology for presentation and discussion with specialists and non-specialists of research results, scientific and applied problems of avionics in state and foreign languages, qualified reflection of research results in scientific publications in leading international scientific journals.
KN 3	Basic legislative acts that regulate the relationship between the subjects of scientific and scientific and technical activities, including activities at the international level.
SKILLS	
SK 1	Develop and research conceptual, mathematical and computer models of processes and systems, effectively use them to gain new knowledge and / or create innovative products in the field of avionics and related interdisciplinary areas
SK 2	Plan and perform experimental and / or theoretical research in avionics and related interdisciplinary areas using modern tools, critically analyze the results of their own

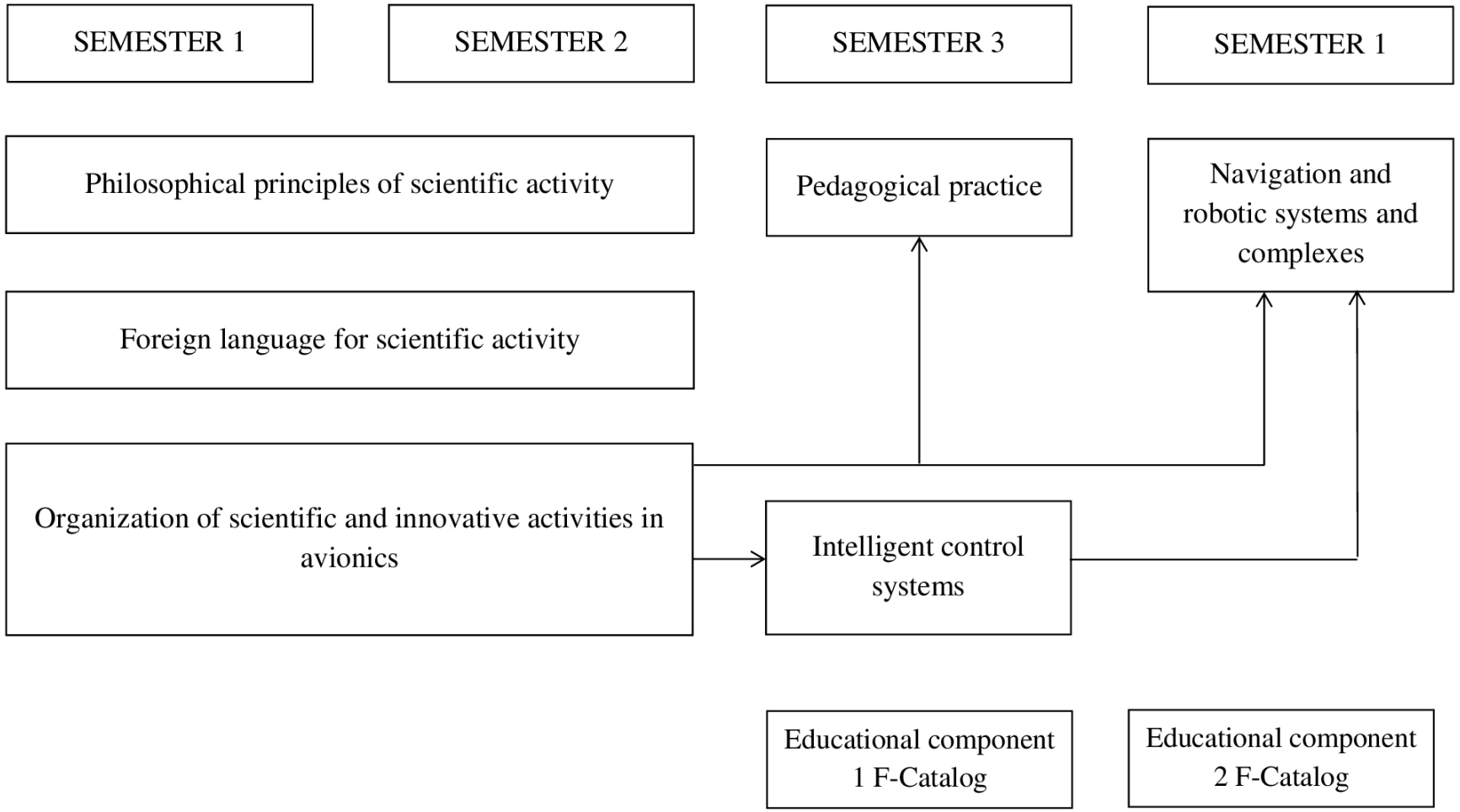
	research and the results of other researchers in the context of the whole set of modern knowledge about the research problem.
SK 3	Implement software and hardware means and application packages for the design of control systems of aviation, rocket and outer space technologies, systems and devices in the relevant interdisciplinary areas on the basis of the conducted research.
SK 4	Develop and analyze new algorithms for the operation of aircraft avionics in conditions of uncertainty and incompleteness of a priori information.
SK 5	Analyze existing and synthesize new methods and models for diagnosing, maintaining and repairing avionics.
SK 6	Summarize the results of scientific research in the form of scientific and technical reports, articles, abstracts, monographs, and transfer knowledge, decisions and the basis for their adoption to specialists and non-specialists in a clear and unambiguous form
SK 7	Organize and implement international scientific and technical projects, including in a foreign language

8 - Resource support for program implementation	
Staffing	In accordance with the personnel requirements for ensuring the implementation of educational activities for the third level of HE (Annex 2 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187, with changes according to RCMU № 347 dated 10.05.2018.
Logistics	In accordance with the technological requirements for material and technical support of educational activities of the third level of HE (Annex 4 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187, with changes according to RCMU № 347 dated 10.05.2018.
Information and educational and methodical support	In accordance with the technological requirements for educational and methodological and informational support of educational activities of the third 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, with changes according to RCMU № 347 dated 10.05.2018.
9 - Academic mobility	
National credit mobility	Exchange programs between partner universities, harmonization of the content of disciplines with the related disciplines of profile educational institutions.
International credit mobility	Opportunities for exchange between partner universities of other countries, implementation of a double degree program with EU universities. Participation in international educational programs. To determine knowledge and skills that students should acquire in the learning process, European standards of higher education for related specialties are taken into account.
Training of foreign applicants HE	Learning on Ukrainian or English (subject to possession of language skills at the B2 level and over)

2. LIST OF COMPONENTS OF THE EDUCATIONAL COMPONENT OF THE EDUCATIONAL AND SCIENTIFIC PROGRAM

Code	Components of the educational program (academic disciplines, course projects / works, practices)	Number of ECTS credits	Form final control
Obligatory (regulatory) components of the EP			
ZO1	Philosophical principles of scientific activity	6	Exam
ZO2	Foreign language for scientific activity	6	Exam
ZO3	Intelligent control systems	6	Exam
ZO4	Navigation and robotic systems and complexes	6	Exam
ZO5	Organization of scientific and innovative activities in avionics	4	Exam
ZO6	Pedagogical practice	2	Test
Selective components of the EP			
V1	Educational component of 1F catalog	5	Exam
V2	Educational component of 2F catalog	5	Exam
Total amount of obligatory educational components:		30	
The total amount of selective educational components:		10	
TOTAL AMOUNT OF THE EDUCATIONAL COMPONENT OF PROGRAM		**40**	

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



4. SCIENTIFIC COMPONENT

Year training	The content of the graduate student's scientific work	Form of control
1 year	Choice and substantiation of the topic of own scientific research, determination of the content, terms of performance and volume of scientific works; selection and substantiation of the methodology of own research, review and analysis of existing views and approaches that have developed in modern science in the chosen field. Preparation and publication of at least 1 article (usually a review) in scientific professional publications (domestic or foreign) on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Approval of the individual plan of the graduate student's work at the academic council of the institute / faculty, reporting on the progress of the individual graduate student's plan twice a year
2 year	Conducting own research under the guidance of the supervisor, which involves solving research problems through the use of a set of theoretical and empirical methods. Preparation and publication of at least 1 article in scientific professional publications (domestic or foreign) on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Reporting on the progress of the individual graduate student's plan twice a year.
3 year	Analysis and generalization of the obtained results of own scientific research; substantiation of scientific novelty of the obtained results, their theoretical and / or practical significance. Preparation and publication of at least 1 article in scientific professional publications on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Reporting on the progress of the individual graduate student's plan twice a year.
4 year	Registration of scientific achievements of the post-graduate student in the form of the dissertation, summing up concerning completeness of coverage of results of the dissertation in scientific articles according to the current requirements. Implementation of the obtained results and receipt of supporting documents. Submission of documents for preliminary examination of the dissertation. Preparation of a scientific report for final certification (defense of the dissertation).	Reporting on the progress of the individual graduate student's plan twice a year Providing an opinion on the scientific novelty, theoretical and practical significance of the dissertation results.

5. FORM OF FINAL EXAMINATION OF APPLICANTS FOR HIGHER EDUCATION

Final examination of applicants for higher education in the educational program "Control systems of flight vehicles and complexes engineering" specialty 173 "Avionics" is carried out in the form of defense of the qualification work and ends with the issuance of a standard document conferred Doctor of Philosophy degree and qualification: Doctor of Philosophy in Avionics. The dissertation on the topic of scientific research is checked for plagiarism and is placed in the repository of the NTB of the University for free access after the defense.

Final examination is open and public.

6. MATRIX OF CORRESPONDENCE OF PROGRAM COMPETENCIES TO COMPONENTS OF THE EDUCATIONAL PROGRAM

	ZO 1	ZO 2	ZO 3	ZO4	ZO5	ZO 6	scientific component
GC01	+		+	+			+
GC02	+	+	+	+	+	+	+
GC03		+				+	
GC04					+		+
GC05	+				+	+	
GC06		+					+
GC07					+	+	+
GC08	+				+		
PC01		+			+	+	+
PC02			+	+			
PC03					+		+
PC04			+	+			
PC05			+	+			

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

	ZO 1	ZO 2	ZO 3	ZO4	ZO5	ZO 6	scientific component
KN 1	+		+	+	+	+	+
KN 2	+	+				+	+
KN 3		+			+		
SK 1			+	+			+
SK 2	+				+		+
SK 3			+	+			
SK 4			+	+			+
SK 5	+		+	+	+		+
SK 6	+	+			+	+	+
SK 7		+			+	+	