MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
"Igor Sikorsky Kyiv Polytechnic Institute"

APPROVED
by University Academic Council Meeting
protocol № _6_ from September 07, 2020
Chairman of the Academic Council
_____ Mikhail ILCHENKO

LS

Aviation and rocket-space technology

EDUCATIONAL AND SCIENTIFIC PROGRAM

third (PhD) level of higher education

Speciality	**134 Aviation and rocket-space technology**
Area of expertise	**13 Mechanical engineering**
Qualification	**PhD in Aeronautic and rocket-space engineering**

Enacted by the order of rector
Igor Sikorsky Kyiv Polytechnic Institute
№ _1/282_ from September 17, 2020

Kyiv – 2020

PREAMBLE

DEVELOPED by project group:

Chairman of project group (guarantor of educational and scientific program):

Volodymyr KABANIACHYI, Doctor of Technical Sciences, Acting Head of the Department of Aircraft and Rocket Engineering.

Члени проектної групи зі спеціальності:

Vitalii SUKHOV, Doctor of Technical Sciences, Professor of Department of Aircraft and Rocket Engineering.

Alexander Arkhypov, Doctor of Technical Sciences, Professor of Department of Aircraft and Rocket Engineering.

Dmytro ZINCHENKO, Candidate of Technical Sciences, Associate Professor of Department of Aircraft and Rocket Engineering.

Yuryi BONDAR, Candidate of Technical Sciences, Associate Professor of Department of Aircraft and Rocket Engineering.

Acting Head of the Department of Aircraft and Rocket Engineering,

Volodymyr KABANIACHYI, Doctor of Technical Sciences.

AGREED:

Scientific and methodological committee of the university in the specialty 134 "Aviation and rocket-space technology"

Head of SMCU 134 _____ Volodymyr KABANIACHYI

(protocol № _3_ from August 28, 2020)

Methodical Council of the University

Chairman of Methodical Council _____ Yuriy YAKYMENKO

(protocol № _1_ from September 03, 2020)

TAKEN INTO ACCOUNT:

Proposals of the heads and leading specialists of specialized enterprises, in particular, Dnipro National University, National Aerospace University (XAI), Yuzhny Machine-Building plant, ANTONOV COMPANY, Progresstech Ukraine Ltd., ARTEM Company.

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1. Profile of educational program

speciality 134 "Aviation and rocket-space technology"

1 – Total information	
Full name of the university and institute/faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Institute of Aerospace Technologies.
Higher education level and qualification in the original language	Level – PhD. Qualification – PhD in aeronautic and rocket-space technology.
Official name of the educational program	Aviation and rocket-space technology.
Diploma type and scope of educational program	PhD diploma, Educational component 40 ECTS Credits, term of study 4 years. Scientific component provides a bringing of the own research and design of its results in the form of a dissertation.
Availability of accreditation	Accredited in the first time.
Prerequisites	Availability of a master's degree.
Language(s) of lecturing	Ukrainian/English.
The validity of educational program	Until the next accreditation.
Internet address of educational program permanent location	http://iat.kpi.ua
2 – Purpose of the educational program	
Training of a specialist capable of setting and solving complex research tasks, in particular, to improve existing and develop new methods of designing of the aviation technology objects and carry out their scientific testing, that is associated with research and characterized by uncertainty of conditions and requirements.	

3 – Characteristics of educational program	
Subject area	Objects of study - phenomena and problems related to the stages of the life cycle of aerospace and space technology objects and their systems, that require updating and integration of knowledge at the incomplete/insufficient information and conflicting requirements. Theoretical content of the subject area - models of physical processes in the objects of aviation and rocket and space technology, modern concepts of deformed solids mechanics, aero- and gas dynamics, thermophysics and electrical engineering. Methods, techniques and technologies - modern analytical, numerical and experimental methods of research of the subject area, methods and technologies for solving the complex tasks and problems related with the stages of the life cycle of aviation and the rocket-space technology. The tools and equipments - laboratory equipment with measuring means, in particular hydraulic stands, wind tunnels, equipments for research of material properties, stress-strain state of structures; equipment for the assembly and testing of the objects of aviation and rocket-space technology, computers with information and specialized software for the design and manufacture of structures of aviation and rocket and space technology.
The educational program orientation	Educational and scientific.
The main focus of educational program	1. General education in specialty 134 Aviation and rocket and space technology. 2. Special education in engineering of aerospace and rocket systems in specialty 134 Aviation and rocket and space technology. 3. The program is based on well-known scientific principles, taking into account the current status of development the systems of aviation and rocket-spaces technique, orients to the actual specializations in which further professional and scientific careers are possible: computer technology for modeling of systems and processes and composite structural materials.
The features of education program	• Keywords: airframe, structure, flight dynamics, control systems, reliability, fault tolerance. • Implementation of the program envisages the involvement to the classroom trainings practicing professionals, industry experts, employers' representatives. • Envisage the studying in English. • Students acquire the skills of describing design algorithms using modern object-oriented information technologies.
4 – Suitability of graduates for employment and further study	
Suitability for employment	• Researcher (engineering mechanics). • Researcher (computer systems). • Lecturer at the university and higher education institution.
Further education	Continuation the education in doctoral studies and/or participation in postdoctoral programs.

5 – Teaching and assessment	
Teaching and learning	The general style of study is problem-oriented. Teaching is carried out in the form of lectures, seminars, practical classes, laboratory classes in small groups (up to 8 people), independent work with the possibility of consultation with the lecturer, individual classes with the use of information and communication technologies (Pro/Engineer, CATIA, Nastran, FEMAP, ODBMS Space). Applicants get a full research practice through the use of specialized laboratory equipment, which is equipped with laboratories of the department, as well as laboratories of specialized industrial enterprises and research institutions. Applicants are also involved in the process of teaching special subjects, in accordance with the curricula of the department. In order to implement and test the results of scientific research, applicants participate in scientific seminars and conferences that take place at the department, at the university level and in other scientific institutions.
Evaluation	Current and semester control in the form of laboratory reports, calculation and graphic works, abstracts, written and verbal examinations and dissertation defense. The evaluation is carried out in accordance with the defined criteria of the Rating system.
6 – Program competencies	
Integral competence	Ability to solve the complex problems in the field of professional, including the research and innovation, which involves a deep rethinking of existing and the creation of new holistic knowledge and/or professional practice.
General competencies	3K 1. Ability to abstract thinking, analysis and synthesis. 3K 2. Ability to identify, set and solve research problems. 3K 3. Ability to develop and manage research projects, including working in an international context. 3K 4. Skills in using the modern information and communication technologies. 3K 5. Skills of preparation and carrying out of educational trainings with use of modern technologies of training. 3K 6. Proficiency in English at a level sufficient to present scientific results and a full understanding of scientific texts.

Professional competencies	ФК 1. Ability to apply the knowledge in the field of solid, fluid, gas and plasma mechanics to develop mathematical models related with specialization. ФК 2. Skills in the use and development of specialized software that are used at the analysis of the objects of aircraft and rocket-space technology. ФК 3. Skills in planning, conducting and processing experimental research using the latest automated equipment. ФК 4. Ability to independently perform the research activities in the field of aviation and rocket-space technology using the modern theories, methods and information and communication technologies. ФК 5. Ability to develop and use the methods of conduct the bench tests of mechanical structures of aircraft, with the introduction the necessary corrects that take into account the differences in physical properties of bench models from the real structures and the features of laboratory conditions. ФК 6. Ability to conduct theoretical research, mathematical and computer modeling of aerodynamic phenomena and processes. ФК 7. Ability to conduct mathematical and computer modeling of mechanical structures, taking into account the elastic and inertial properties. ФК 8. Ability to develop and use methods for laboratory and the real aerodynamic tests of aircraft, with the introduction of the necessary corrections that take into account the differences in the physical properties of laboratory models from the real structures and the special laboratory conditions, as well as the considering of all types of inaccuracies. ФК 9. Ability to plan, organize work and manage projects in the field of knowledge 13 "Mechanical Engineering". ФК 10. Ability to identify promising research areas based on several related fields of knowledge, to develop and plan research projects based on them. ФК 11. Ability to organize initiative research groups, consisting the specialists from several fields of knowledge, to implement cross-sectoral research projects, to manage such groups. ФК 12. Ability to develop and conduct all types of trainings in higher education institution. ФК 13. Ability to apply the modern pedagogical, including information technologies in the educational process.

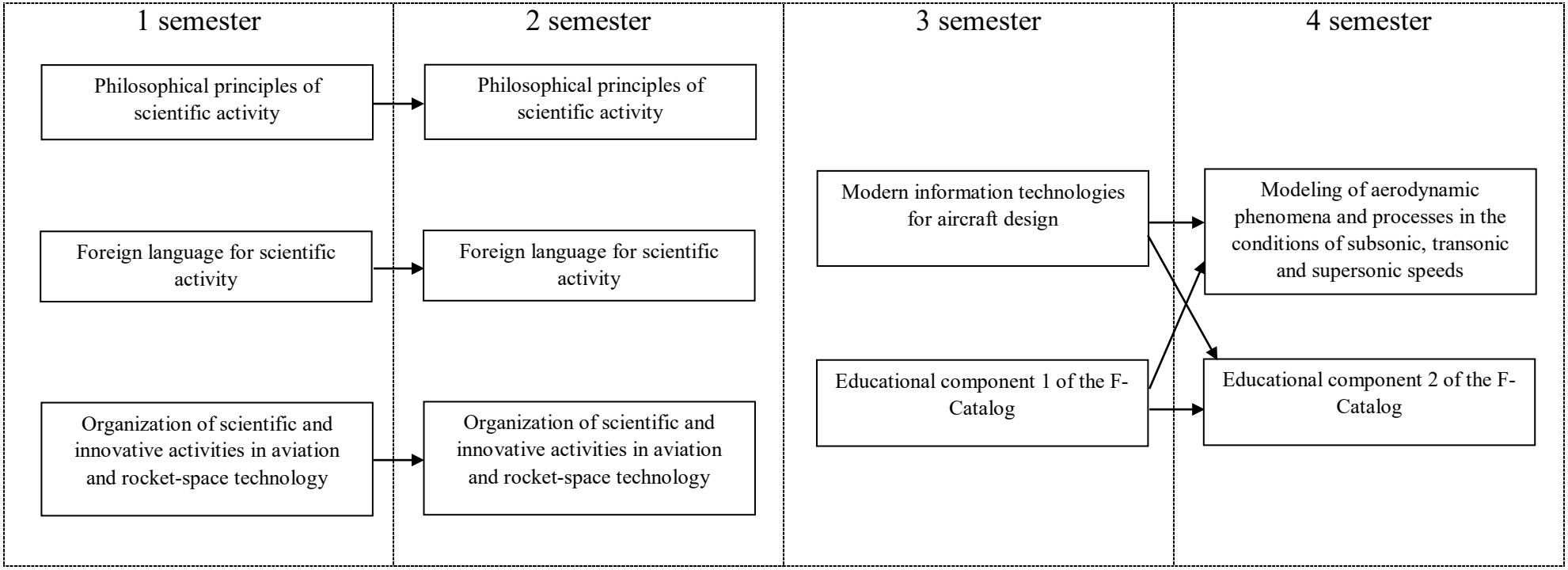
7 – Program learning results	
ПРН 1.	Knowledge of procedures for preparation of research projects on the domestic and international grants and competitions.
ПРН 2.	Ability to think systematically and apply the creative abilities to the formation of fundamentally new ideas. Demonstrate their own opinions, ability to discuss, to defend reasonably the taken decision.
ПРН 3.	Ability to critically comprehend the scientific problems of the aviation and/or rocket-space technology, including on a border with the related fields. Demonstrate creativity and ability to act systematically in process of realisation of scientific research.
ПРН 4.	Ability to prepare application materials for the protection of intellectual property rights for the technical solutions created in the course of scientific and technical activities.
ПРН 5.	Ability to use the modern information technologies in scientific activities, including applications for preparing of articles in international scientific journals.
ПРН 6.	Ability to use the modern multimedia technologies at the conducting training sessions, including distance learning technologies.
ПРН 7.	Ability to communicate in English according to the requirements sufficient to obtain a language certificate at a level not lower than B2.
ПРН 8.	Ability to speak academic English at the level sufficient for presentation of research results in international scientific journals.
ПРН 9.	Ability to reasonably select and develop mathematical models to describe complex related tasks that are linked to the processes of design, manufacture, testing and (or) certification of aviation and rocket-space technology.
ПРН 10.	The confirmed by professional certificates ability to use the latest specialized software for solving problems in scientific activity in accordance with the educational program.
ПРН 11.	Ability to develop methods of experimental research of processes and objects of aviation and rocket-space technology using the latest automated equipment.
ПРН 12.	Ability to determine the causal relationships links between the characteristics of technological systems and objects of the aviation and rocket-space technology, understanding and skills of using the principles of systematic analysis for the improvement and development.

8 – Resource support for program implementation	
Staffing	The staff of the Department of Aviation and Rocket Engineering meets the licensing conditions for the training of specialists in the educational and scientific program "Aviation and rocket-space technology" specialty 134 Aviation and Rocket and Space Engineering at the third (PhD) level. The department has a sufficient number of the lecturer with academic degrees and titles, all indicators of staffing meet the licensing requirements
Logistics	The actual status of logistics meets the license conditions. The educational process of training specialists is fully provided with training areas, necessary equipment, computer equipment, specialized laboratories, access to information sources.
Information and the educational and methodical provision	In accordance with the technological requirements for scientific and methodological and the information provision of educational activitiesm, the Department of Aircraft and Rocket Engineering has a modern library fund, that is constantly updated, access to professional domestic and foreign periodicals. These data meet the licensing requirements.
9 – Academic mobility	
National credit mobility	Postgraduate students have the opportunity to do internships in European universities thanks to the international mobility programs ERASMUS-EWENT and ERASMUSACTIVE. Partner universities: Warsaw University of Technology (Poland), Central School of Nantes (France), University of the Basque Country (Spain), University of Trento (Italy), Czech Technical University (Czech Republic), Budapest University of Engineering and Economics (Hungary), Dublin Technical Institute (Ireland), Southampton University (UK), Stuttgart Technical University (Germany), Berlin Technical University (Germany), Northwestern Polytechnic University (China), Dalian Maritime University (China), etc.
International credit mobility	Double degree agreements have been concluded with EU universities.
Training of foreign applicants for higher education	Training of foreign applicants for higher education in English is organized.

2. The list of components of the educational component of educational and scientific program

Code	Components of the educational program (subjects, course projects/works, practices, qualification work)	ECTS Credits	Form of final control
Normative components			
ZO 1	Philosophical principles of scientific activity	6	Exam
ZO 2	Foreign language for scientific activity	6	Exam
ZO 3	Modern information technologies for aircraft design	6	Exam
ZO 4	Modeling of aerodynamic phenomena and processes in the conditions of subsonic, transonic and supersonic speeds	6	Exam
ZO 5	Organization of scientific and innovative activities in aviation and rocket-space technology	4	Exam
ZO 6	Pedagogical practice	2	Final test
Elective components			
V 1	Educational component 1 of the F-Catalog	5	Exam
V 2	Educational component 2 of the F-Catalog	5	Exam
Total in Normative components:		**30**	
Total in Elective components:		**10**	
TOTAL		**40**	

3. Structural and logical scheme of educational program



4. Scientific component

Year of training	The content of the graduate student's scientific work	Forms of control (Reporting)
1st 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.
2st 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.
3st 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.
4st 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 conclusion on the scientific novelty, theoretical and practical significance of the dissertation results.

5. The certification form of applicants for higher education

Graduation certification of higher education applicants under the educational program "Aviation and rocket-space technology" is carried out in the form of dissertation defense and ends with the issuance of a standard document on awarding him the degree of Doctor of Philosophy with the qualification: Doctor of Philosophy in Aeronautic and Rocket-Space Technology. Qualification work is checked for plagiarism and after the defense is placed in the repository of NTB University for free access. Graduation certification is carried out openly and publicly.

6. Matrix of correspondence of program competences to components of educational program

	ZO 1	ZO 2	ZO 3	ZO 4	ZO 5	ZO 6	V 1	V 2	Scientific component
ЗК 1	+								+
ЗК 2					+				+
ЗК 3					+				+
ЗК 4			+				+	+	+
ЗК 5					+	+			
ЗК 6		+							
ФК 1			+	+			+	+	+
ФК 2			+						
ФК 3							+	+	+
ФК 4			+	+	+				+
ФК 5			+				+		
ФК 6				+				+	+
ФК 7								+	+
ФК 8				+			+		+
ФК 9					+				
ФК 10	+				+				
ФК 11					+		+	+	
ФК 12						+			+
ФК 13			+			+			+

7. Matrix of providing of program results of learning with relevant components of educational program

	ZO 1	ZO 2	ZO 3	ZO 4	ZO 5	ZO 6	V 1	V 2	Scientific component
ПРН 1					+		+	+	+
ПРН 2			+	+	+				+
ПРН 3	+				+				+
ПРН 4					+				
ПРН 5					+		+	+	+
ПРН 6						+			
ПРН 7		+							
ПРН 8		+							+
ПРН 9			+	+			+	+	+
ПРН10			+	+					
ПРН 11							+	+	+
ПРН12			+	+			+	+	+