

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

APPROVED

by the Academic Council  
of Igor Sikorsky Kyiv Polytechnic Institute  
(protocol № 8 from 12.12.2022)  
Chairman of the Academic Council

Mykhailo ILCHENKO

**Airplanes and Helicopters**  
**EDUCATIONAL PROFESSIONAL PROGRAM**  
**second (master's) level of higher education**

<b>Speciality</b>	<b>134 Aviation and Aerospace Technologies</b>
<b>Field of knowledge</b>	<b>13 Mechanical Engineering</b>
<b>Qualification</b>	<b>Master in Aviation and Aerospace Technologies</b>

Enacted from the 2023/2024 academic year  
by the order of rector Igor Sikorsky Kyiv  
Polytechnic Institute  
from 17.05.2023 № HOH/165/2023

Kyiv – 2022

## PREAMBLE

DEVELOPED by project group:

Chairman of project group:

**Petro LUKIANOV**, Candidate of Physical and Mathematical Sciences, Associate Professor of the Department of Aircraft and Rocket Engineering, guarantor of master's educational and professional program "Airplanes and helicopters".

Members of the project group:

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

**Volodymyr KABANIACHYI**, Doctor of Technical Sciences, Professor of the Department of Aircraft and Rocket Engineering.

**Oleksandr BONDARENKO**, Candidate of Technical Sciences, Associate Professor of Department of Aircraft and Rocket Engineering.

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

**Viktor BORYSOV**, Senior Lecturer of Department of Aircraft and Rocket Engineering.

**Dmytro KONOTOP**, Candidate of Technical Sciences, Leading Engineer of Antonov State Enterprise.

**Ihor LUCHKO**, postgraduate of Department of Aircraft and Rocket Engineering.

### AGREED:

Scientific and methodological committee of the university in the specialty 134 "Aviation and Aerospace Technologies "

Chairman of SMCU 134  
(protocol № 2 from 21.11.2022)

Volodymyr KABANIACHYI

Methodical Council of the University

Chairman of the Methodological Council  
(protocol № 3 from 01.12.2022)

Anatolii MELNYCHENKO

## **TAKEN INTO ACCOUNT:**

Proposals of the heads and leading specialists of specialized enterprises, in particular, ANTONOV COMPANY, Progresstech Ukraine Ltd., State Enterprise State Kyiv Design Bureau "LUCH", AEROPRAKT LLC, the experience of leading higher education institutions of Ukraine, including the Dnipro National University and the National Aerospace University (KhAI).

Standard of higher education in specialty 134 Aviation and Aerospace Technologies for thesecond (master's) level of higher education.

Provisions on the development, approval, monitoring and revision of educational programs at Igor Sikorsky Kyiv Polytechnic Institute: <https://osvita.kpi.ua/node/137>

The results of the self analysis of educational program in 2022.

Recommendations for arranging and detailing multi-credit educational components (order of Igor Sikorskyi KPI No. NON/282/2022 dated October 4, 2022 "On updating the educational programs of Igor Sikorskyi KPI").

The update of the educational program is agreed with the stakeholders, the positive feedback provided on the program remains relevant.

The draft of the educational program was discussed at the meeting of Department of Aviation and Rocket Engineering (protocol dated 13.10.22 № 2).

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# 1. EDUCATIONAL PROGRAMME PROFILE

<b>1 – Total information</b>	
Full name of the university and institute/faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Educational and scientific institute of Aerospace Technologies
Higher education level and qualification in the original language	Level – Master Qualification – Master in Aviation and Aerospace Technologies
Official name of the educational program	Airplanes and Helicopters
Diploma type and scope of educational program	Master's diploma, single, 90 credits ECTS, term of study 1 year 4 months
Availability of accreditation	Certificate of accreditation of the specialty UD 11007490, valid until 01.07.2024
Cycle/level of HE	Ukrainian NQF – 7 level; QF-EHEA – second circle; EQF-LLL – 7 level
Prerequisites	Availability of a bachelor's degree
Language(s) of lecturing	Ukrainian/English
The validity of educational program	Until the next accreditation
Internet address of educational program permanent location	<a href="https://osvita.kpi.ua/op">https://osvita.kpi.ua/op</a> , <a href="https://arb.kpi.ua/uk/education/osvitni-prohramy">https://arb.kpi.ua/uk/education/osvitni-prohramy</a>
<b>2 – Purpose of the educational program</b>	
<p>Training of highly qualified professionals capable of: solving complex tasks and problems in professional activities related to the development, production and (or) certification of aviation and rocket-space equipment, its engines and power plants, structures and systems or in the process of training, which related to research and/or innovation and characterized by uncertainty of conditions and requirements; to create modern scientific knowledge and innovative technologies for the benefit of humanity and ensure a worthy place for Ukraine in the world community.</p> <p>The purpose of the educational program corresponds to the development strategy of Igor Sikorsky KPI for 2020-2025.</p>	
<b>3 – Characteristics of educational program</b>	
Subject area	<p><b>Objects of study</b> - phenomena and problems related to the life cycle stages of aviation and space rocketry technologies.</p> <p><b>The purpose of training</b> - training of specialists capable of solving complex tasks and problems in professional activities related to the development, production and (or) certification of aviation and rocket-space technology, its engines and power plants, structures and systems or in the process of training, which related to research and/or innovation and characterized by uncertainty of conditions and requirements.</p>

	<p><b>Theoretical content of the subject area</b> - theoretical foundations of development and production of objects of aviation and rocket and space technology.</p> <p><b>Methods, techniques and technologies</b> - modern analytical, numerical and experimental methods of research of the subject area, methods and technologies for solving complex problems and problems related to the stages of the life cycle of aviation and rocket and space technology.</p> <p><b>Instruments and equipment</b> - laboratory equipment with measuring devices, in particular hydraulic stands, wind tunnels, equipment for researching the properties of materials, the stress-strain state of structures; equipment for the assembly and testing of aviation and space rocketry technology, computers with information and specialized software for the design and production of structures of aviation and space rocketry technology.</p>
The educational program orientation	Educational and professional.
The main focus of educational program	<p>The program is based on well-known scientific principles, taking into account the current state of development of the aerospace industry, focuses on current information and production technologies, in which further professional and scientific career is possible: computer technology modeling systems and processes, object-oriented programming, composite materials, diagnostics and control technical objects.</p> <p>Key words: airplanes, helicopters, rockets, space vehicles, aerodynamics, strength, resource</p>
The features of education program	<p>Education is conducted with elements of dual education.</p> <p>The implementation of the program involves the involvement of practicing professionals, industry experts, and representatives of employers in classroom classes.</p> <p>Students will acquire the skills of describing design and management algorithms using modern object-oriented information technologies.</p>
<b>4 – Suitability of graduates for employment and further study</b>	
Suitability for employment	<p>ДК 003:2010, Codes: 2145. Professionals in the field of Mechanical Engineering. 2145.2 Mechanical engineers.</p>
Further education	Continuation of education at the third (educational and scientific) level of higher education and/or acquisition of additional qualifications in the system of adult education.
<b>5 – Teaching and assessment</b>	
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 teacher, individual classes with the use of information and communication technologies (Pro/Engineer, CATIA, Nastran, FEMAP, ODBMS Space).
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.

<b>6 – Program competencies</b>	
Integral competence	Ability to solve complex problems and problems in professional and scientific activities in the development, production and (or) certification of aerospace and rocketry technologies, its engines and power plants, structures and systems or in the learning process, which are related to research and/or innovation and characterized by uncertainty of conditions and requirements.
General competencies	<p>GC 1. Ability to abstract thinking, analysis and synthesis.</p> <p>GC 2. Ability to identify, set and solve problems.</p> <p>GC 3. Ability to conduct research on the appropriate level.</p> <p>GC 4. Ability to generate new ideas (creativity).</p> <p>GC 5. Ability to use information and communication technologies.</p> <p>GC 6. Ability to adapt and act in a new situation.</p> <p>GC 7. Determinedness and persistence to the assigned tasks and assumed responsibilities.</p> <p>GC 8. Ability to learn and master modern knowledge.</p> <p>GC 9. Ability to apply knowledge in practical situations.</p> <p>GC 10. The ability to communicate in a foreign language in professional (scientific and technical) activities.</p> <p>GC 11. Ability to make management decisions, assess their possible consequences and take responsibility for the results of their activities and the team.</p> <p>GC 12. Ability to teach academic subjects in institutions of higher education.</p>
Professional competencies	<p>PC 1. Awareness of the history, current state, problems and prospects of the development of aviation and rocket and space technology.</p> <p>PC 2. The ability to critically consider the problems of aviation and/or rocket and space technology, including on the border with related fields, engineering sciences, physics, chemistry, ecology, economics</p> <p>PC 3. Ability to qualitatively choose a class of materials for structural elements of aerospace and rocket technique.</p> <p>PC 4. Ability to evaluate the technical and economic efficiency of design, research, technological processes and innovative developments.</p> <p>PC 5. The ability to create, improve and apply mathematical and numerical methods of modeling properties, phenomena and processes in systems and elements of aviation and rocket and space technology.</p> <p>PC 6. Ability to set and solve professional problems based on basic knowledge in the field of hydraulic, pneumatic, electrical and electronic systems.</p> <p>PC 7. Ability to carry out works on the preparation of production of aerospace and rocket and space technology using the latest technologies.</p> <p>PC 8. The ability to determine the optimal structures of samples of aviation and rocket and space technology, and to optimize the parameters of structural elements and systems.</p> <p>PC 9. The ability to optimize the aerodynamic characteristics of samples of aviation and rocket and space technology.</p>

## 7 – Programme learning outcomes

- PL 1. Know and understand the principles of fundamental and engineering sciences that underlie aviation and/or rocket and space technology.
- PL 2. Know and understand working processes in systems and elements of aviation and/or rocket and space technology, necessary for understanding, describing, improving and optimizing their parameters.
- PL 3. Understand and apply the principles and methods of system analysis when solving complex professional (scientific and technical) problems.
- PL 4. Use the modern methods of solving inventive problems, protect intellectual property on technical solutions and other results of professional (scientific and technical) activity.
- PL 5. Use the latest specialized software to solve complex problems in professional (scientific and technical) activities in accordance with the educational program.
- PL 6. Make the decisions in the event of non-standard complex tasks in professional (scientific and technical) activities in conditions of uncertainty of requirements, the presence of a range of opinions and limited time.
- PL 7. Demonstrate the skills of independent and collective work, leadership qualities, organize work under conditions of limited time with an emphasis on professional integrity.
- PL 8. Compile report documentation based on the results of solving complex professional (scientific and technical) problems, present the completed research in the form of scientific reports, publications, reports at conferences, etc.
- PL 9. Reasonable assign a class of materials for elements and systems of aviation and rocket and space technology, to choose and apply effective methods of modifying their properties.
- PL 10. Analyse the economic efficiency of the production of elements and systems of aviation rocket and space technology.
- PL 11. Reasonable assign quality indicators of objects of aviation and rocket and space technology.
- PL 12. Apply the requirements of industry and international normative documents when formulating and solving scientific and technical problems of design, production, repair, assembly, testing and (or) certification of elements and objects of aviation and rocket and space technology at all stages of its life cycle.
- PL 13. Assess the stability and controllability of the aircraft, determine the initial parameters for the formation of the appearance of aviation and rocket and space technology.
- PL 14. Organize the performance of complex tasks in professional activities by a team.
- PL 15. Apply modern methods and means of design and technological preparation of production, including computerized flexible production, assembly and testing of elements and systems of modern aviation and rocket and space technology.
- PL 16. Analyse the stress-strain state, determine the load-bearing capacity of structural elements and the reliability of aviation and space rocket systems with the use specialized software used in the industry.
- PL 17. Use in practice modern methods and means of design, production, testing, repair and (or) certification of aviation and space rocket systems.
- PL 18. Determine and optimize the parameters of technological processes, including with the use of automated computer design of parts, units and systems of aviation and rocket and space technology.
- PL 19. Develop and teach academic subjects in institutions of higher education.
- PL 20. The ability to communicate in a foreign language at a level that provides the ability to communicate in a professional environment and use scientific and technical documentation in the subject area.
- PL 21. The ability to analyze the dynamics of aviation and rocket and space technology objects.

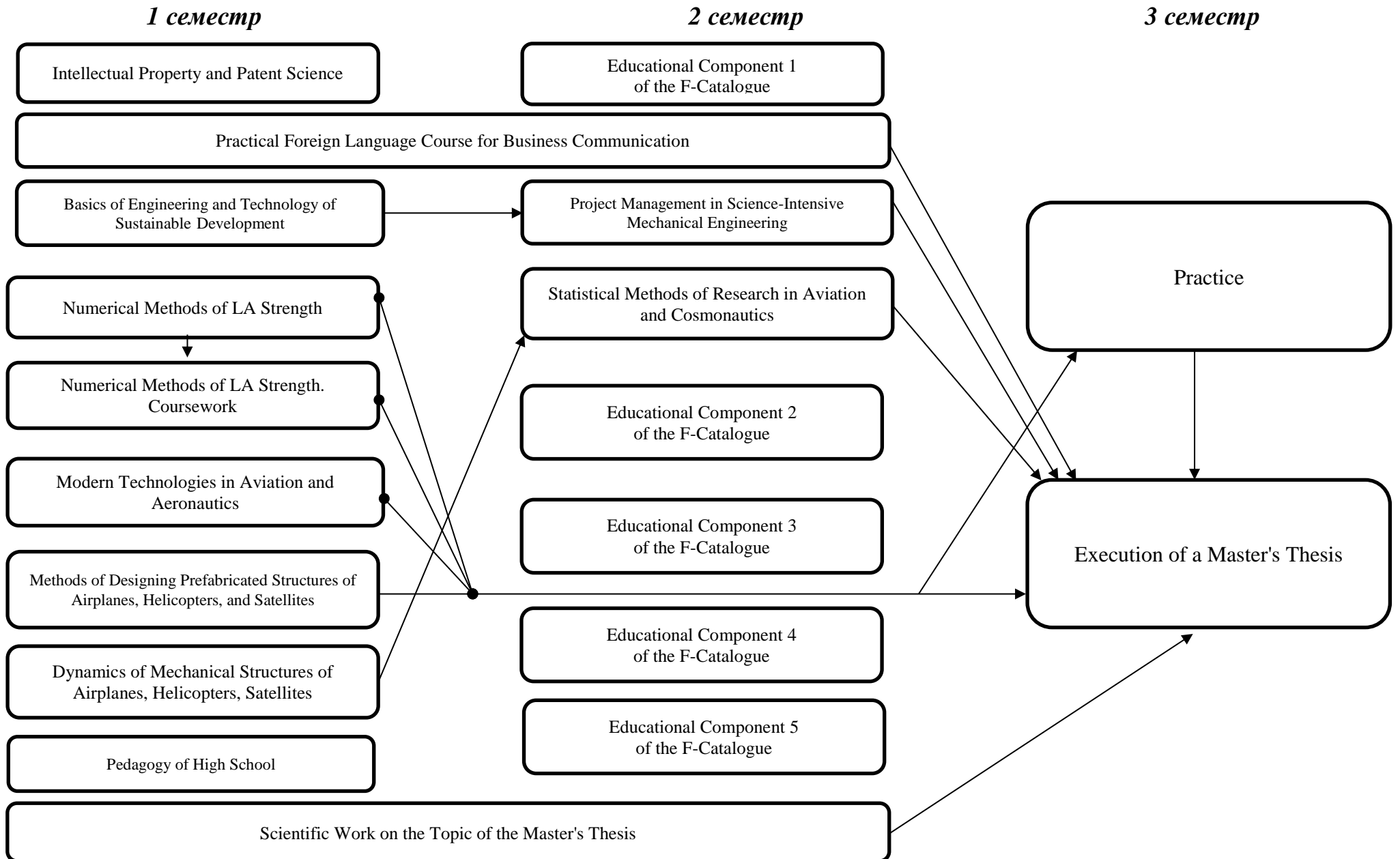


<b>8 – Resource support for program implementation</b>	
Staffing	At the graduate department, 9 full-time scientific and pedagogical workers (including internal part-time workers), 7 scientific and pedagogical workers who work part-time (external part-time workers) teach according to the educational program; as part of the scientific and pedagogical staff of the graduation department, 3 doctors of technical sciences, 7 candidates of technical sciences. Scientific and pedagogical workers who provide educational components meet the educational and/or professional qualifications, in accordance with the Licensing Terms for conducting educational activities, which were approved by the Resolution of the Government of Ukraine № 1187 from 30.12.2015 in the current version. Scientific and pedagogical workers who ensure the educational process have at least four achievements in professional activity over the last five years, defined in point 38 of the specified Licensing Terms.
Logistics	In accordance with the technological requirements for material and technical support of educational process of the relevant level of HE approved by the Resolution of the Government of Ukraine № 1187 from 30.12.2015 in the current version. Equipment is used for lectures in the form of presentations, network technologies, in particular on the Sikorsky distance learning platform.
Information and the educational and methodical provision	Modern library fund, which is constantly updated, access to professional domestic and foreign periodicals, Scientific and Technical Library of Igor Sikorsky KPI. It accords with the technological requirements for educational and methodological and information support of the educational process of the appropriate level of HE approved by the Resolution of the Government of Ukraine № 1187 from 30.12.2015 in the current version.
<b>9 – Academic mobility</b>	
National credit mobility	A double degree agreement has been signed with Dnipro National University.
International credit mobility	An agreement has been concluded about granting the double diploma with the Risen International Culture Exchange Centre (China).
Training of foreign applicants for higher education	The training of foreign higher education applicants who master the OP under international academic mobility programs can be conducted in English or Ukrainian, provided the applicant has a command of the language of instruction at a level not lower than B2

## 2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code	Components of the educational program (subjects, course projects/works, practices, qualification work)	ECTS Credits	Form of final control
<b>1. Normative educational components</b>			
<b>General training cycle</b>			
ZO 1	Intellectual Property and Patent Science	3	Final Test
ZO 2	Basics of Engineering and Technology of Sustainable Development	2	Final Test
ZO 3	Practical Foreign Language Course for Business Communication	3	Final Test
ZO 4	Project Management in Science-Intensive Mechanical Engineering	3	Final Test
ZO 5	Pedagogy of High School	2	Final Test
<b>Professional training cycle</b>			
PO 1	Numerical Methods of LA Strength	4,5	Exam
PO 2	Numerical Methods of LA Strength. Coursework	1	Final Test
PO 3	Modern Technologies in Aviation and Aeronautics	4	Final Test
PO 4	Methods of Designing Prefabricated Structures of Airplanes, Helicopters, and Satellites	5	Exam
PO 5	Dynamics of Mechanical Structures of Airplanes, Helicopters, Satellites	5	Exam
PO 6	Statistical Methods of Research in Aviation and Cosmonautics	3,5	Exam
PO 7.1	Scientific Work on the Topic of the Master's Thesis. Part 1. Basics of Scientific Research	2	Final Test
PO 7.2	Scientific Work on the Topic of the Master's Thesis. Part 2. Research Work on the Topic of the Master's Thesis	2	Final Test
PO 9	Practice	14	Test
PO 10	Execution of a Master's Thesis	12	Defense
<b>2. Elective educational components</b>			
PV 1	Educational Component 1 of the F-Catalogue	4	Final Test
PV 2	Educational Component 2 of the F-Catalogue	4	Final Test
PV 3	Educational Component 3 of the F-Catalogue	6	Exam
PV 4	Educational Component 4 of the F-Catalogue	4	Final Test
PV 5	Educational Component 5 of the F-Catalogue	6	Exam
<b>Total scope of the required components:</b>		<b>66</b>	
<b>Total scope of the elective components:</b>		<b>24</b>	
<b>TOTAL SCOPE OF THE EDUCATIONAL PROGRAMME</b>		<b>90</b>	

### 3. STRUCTURAL-AND-LOGICAL SCHEME OF THE EDUCATIONAL PROGRAMME



#### 4. THE FORM OF ATTESTATION FOR DEGREE PURSUERS

Certification of applicants for higher education under the educational and scientific program "Aircraft and Helicopters" specialty 134 "Aviation and Aerospace Technologies" is carried out in the form of defense of qualifying work and ends with the issuance of a standard document on awarding him a master's degree with a qualification: Master in Aviation and Aerospace Technologies. Qualification work is checked for plagiarism and after defense is placed in the repository of NTB University for free access. Certification is carried out openly and publicly.

#### 5. COMPLIANCE MATRIX OF PROGRAMME COMPETENCIES WITH PROGRAMME COMPONENTS

	ZO 1	ZO 2	ZO 3	ZO 4	ZO 5	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
GC 1		+												
GC 2		+		+								+	+	+
GC 3				+							+	+		
GC 4	+	+		+										+
GC 5						+	+	+						
GC 6							+					+	+	
GC 7							+						+	+
GC 8	+	+										+	+	+
GC 9							+						+	+
GC 10			+											
GC 11				+									+	
GC 12					+									
PC 1	+			+					+			+		
PC 2	+	+		+								+		
PC 3								+						
PC 4				+										+
PC 5										+	+	+	+	+
PC 6									+		+	+	+	+
PC 7								+				+	+	+
PC 8						+	+			+			+	+
PC 9									+		+			+

#### 6. COMPLIANCE MATRIX OF PROGRAMME LEARNING OUTCOMES WITH PROGRAMME COMPONENTS

	ZO 1	ZO 2	ZO 3	ZO 4	ZO 5	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
PL 1		+							+		+	+		
PL 2		+		+					+	+				
PL 3				+							+			
PL 4	+	+		+								+		
PL 5						+	+							
PL 6							+					+	+	+
PL 7							+					+	+	+
PL 8	+	+							+			+	+	+
PL 9								+		+			+	+
PL 10												+	+	+
PL 11				+							+		+	+
PL 12	+		+						+			+	+	+
PL 13							+		+					+
PL 14				+			+		+			+	+	
PL 15								+				+	+	
PL 16						+	+			+	+			+
PL 17						+	+		+	+		+	+	+
PL 18						+	+	+					+	
PL 19					+							+		
PL 20			+											
PL 21									+	+				