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 №10 from 13.12. 2021)
Head of the Academic Council

Mykhailo ILCHENKO

Airplanes and Helicopters

EDUCATIONAL AND PROFESSIONAL PROGRAM

first (bachelor's) level of higher education

Specialty	**134 Aviation and Aerospace Technologies**
Area of expertise	**13 Mechanical engineering**
Qualification	**Bachelor in Aviation and Aerospace Technologies**

Put into effect from 2022/2023 e.y.
by order of the Rector
Igor Sikorsky Kyiv Polytechnic Institute
from 15.02.2022 №НОН/75/2022

Kyiv – 2021

PREAMBLE

DEVELOPED by project group:

Chairman of project group:

***Olexandr BONDARENKO**, Candidate of Technical Sciences, Associate Professor of Department of Aircraft and Rocket Engineering, Acting Head of the Department of Aircraft and Rocket Engineering, guarantor of bachelor'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.*

***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.*

***Henrikh TITOV**, applicant for higher education.*

***Petro YAKOVENKO**, chief designer, head of the design department of State Enterprise "State Kyiv Design Bureau "LUCH"*

The Department of Aircraft and Rocket Engineering is responsible for the training of applicants for higher education under the educational program.

AGREED:

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

Head of SMCU 134 **Volodymyr KABANIACHYI**

(Protocol №2 from 03.12.2021)

Methodical Council of Igor Sikorsky

Kyiv Polytechnic Institute

Deputy Head of the Methodical Council **Anatolii MELNYCHENKO**

(Protocol №2 from 09.12.2021)

INCLUDED:

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 (XAI).

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

Recommendations on updating educational programs (order of Igor Sikorsky KPI № НОН 248/2021 from October 22, 2021 "On improving educational programs of the Igor Sikorsky Kyiv Polytechnic Institute") and accordingly changed the list of required and selective educational components.

The results of the self analysis of educational program in 2021.

Recommendations for arranging and detailing multi-credit educational components by semesters.

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

The educational program was discussed after receiving all the wishes and suggestions and approved at an extended meeting of the Department of Aviation and Rocketry (protocol №4 from October 29, 2021).

CONTENT

1. Profile of educational program

1 – Total information	
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 – Bachelor Qualification – Bachelor in Aviation and Aerospace Technologies
Official name of the educational program	Airplanes and Helicopters.
Diploma type and scope of educational program	Bachelor's diploma, single, 240 ECTS Credits, term of study 3 years 10 months.
Availability of accreditation	Order of the Ministry of Education and Science of Ukraine № 821 from 12 June 2019. Accreditation period: 2019 - 2029. Certificate of accreditation of specialty UD 11010593 issued by the Ministry of Education and Science of Ukraine, valid until 01 July 2029
Cycle/level of HE	Ukrainian NQF – 6 level; QF-EHEA – first circle; EQF-LLL – 6 level
Prerequisites	Availability of certificate of complete general secondary education.
Language(s) of lecturing	Ukrainian/English.
The validity of educational program	Until the next accreditation.
Internet address of educational program permanent location	https://osvita.kpi.ua/op, http://iat.kpi.ua
2 – Purpose of the educational program	
Training of a specialist capable of solving complex tasks and problems in professional activities related to the development, production and (or) certification of aerospace and rocket technology, its engines and power plants, structures and systems or in the learning process, create all conditions for the training of highly qualified specialists capable of creating modern scientific knowledge and innovative technologies for the benefit of mankind and ensuring a worthy place of Ukraine in the world community. The purpose of the educational program corresponds to the development strategy of Igor Sikorsky KPI for 2020-2025.	
3 – Characteristics of educational program	
Subject area	**Objects of study** - phenomena and problems related to the stages of the life cycle of aerospace and rocketry. **The purpose of training** is to train specialists capable of solving complex specialized and practical problems related to the development, production and certification of aerospace and rocket technology, its engines and power plants, structures and systems, characterized by complexity and uncertainty of conditions. **Theoretical content of the subject area** - the theoretical foundations of development and production of objects and technologies of aviation and space technology. **Methods, techniques and technologies** - analytical, numerical and experimental methods of research of problems of the subject area, in particular integrated computer technologies, techniques and technologies related to the stages of the life cycle of aerospace and rocket technology.

	Instruments and equipment - laboratory equipment with measuring instruments, including hydraulic stands, wind tunnels, equipment for research of material properties, stress-strain state of structures; tools and equipment for the analysis of aircraft and helicopters structures, missile technology, engines and power plants, onboard, navigation, electrical equipment; equipment used for the manufacture, assembly and testing of aircraft and rocket and space technology; computers with information and specialized software, including computer calculation systems, geometric modeling, finite element analysis, integrated design and manufacture of aircraft and rocket and space technology.
The educational program orientation	Educational and professional.
The main focus of the educational program and specialization	Special education in the area of modern information technologies of aircraft design. Keywords: CAD-systems, CAE-systems, aircrafts, helicopters.
Program features	The implementation of the program involves the involvement of classroom practitioners, industry experts, representatives of employers. Execution of laboratory works on the industrial equipment of the profile enterprises.
4 – Suitability of graduates for employment and further education	
Suitability for employment	According to the classifier ДК 003:2010, Code: 2145 Professionals in the field of engineering mechanics, 2145.2 Mechanical engineers; Professional title of work according to profession codes: 22211 Design engineer (mechanics), 2493 Technology engineer (mechanics).
Further education	Access to education at the educational and qualification level "master". Acquisition of additional qualifications in the system of postgraduate education.
5 – Teaching and assessment	
Teaching and assessment	The general learning style is problem-oriented. Teaching is conducted in the form of lectures, seminars, practical classes, laboratory classes in small groups (up to 8 people), independent work with the possibility of consultations with the teacher, individual classes using information and communication technologies (Pro/Engineer, CATIA, FEMAP for Nastran, ANSYS).
Evaluation	Completion and defense of laboratory and practical works, calculation and graphic works, abstracts, written and verb exams and defense of qualification work are evaluated. Assessment of students' knowledge is carried out in accordance with the Regulation on the system of assessment of learning outcomes at Igor Sikorsky Polytechnic Institute for all types of classroom and extracurricular work (current, calendar, semester control).
6 – Program competencies	
Integral competence	Ability to solve complex specialized and practical problems related to the development, production and certification of aerospace and rocket technologies, which involves the application of theories and methods of physics, mathematics and engineering, and is characterized by complexity and uncertainty.
General competencies (GC)	
GC 1	Ability to communicate in official language both verbally and in writing.
GC 2	Ability to communicate in foreign language.
GC 3	Ability to carry out safe activities, the desire to preserve the environment.
GC 4	Ability to use information and communication technologies.
GC 5	Ability to work in a team.

GC 6	Ability to generate new ideas (creativity).
GC 7	Ability to make reasonable decisions.
GC 8	Ability to learn and master modern knowledge.
GC 9	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 and Ukraine.
GC 10	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. use different types and forms of physical activity to rest and lead a healthy lifestyle.
Professional competencies (PC)	
PC 1	Ability to use theories of flight dynamics and control in design the objects of aviation and rocket-space technology.
PC 2	Ability to use the positions of hydraulics, aero- and gas dynamics to describe the interaction of objects with the gas and hydraulic environment.
PC 3	Ability to assign optimal materials for structural elements of the objects of aviation and rocket and space technology.
PC 4	Ability to make the strength analysis of the elements of aviation and rocket-space technology.
PC 5	Ability to design and test the objects of aviation and rocket-space technology, its equipment, systems and subsystems.
PC 6	Ability to develop and implement technological processes of production of elements and objects of aviation and rocket-space technology.
PC 7	Ability to use information and communication technologies and specialized software in training and professional activities.
PC 8	Ability to take into account the economic and managerial aspects of the production of elements and objects of aviation and rocket-space technology in professional activities.
PC 9	Ability to determine the structure and basic parameters of the elements of mechanical systems of aircraft, based on their purpose and operating conditions.
PC 10	Ability to perform aerodynamic analysis of aircraft and helicopters.
PC 11	Ability to determine the optimal structure type of aircraft, depending on its purpose and operating conditions.
PC 12	Ability to plan for wind-tunnel aerodynamic tests and control their executions.
PC 13	Ability to design the elements of mechanical experimental equipment to determine the aerodynamic characteristics of aircrafts, and also parameters of strength and elasticity of their structures.
PC 14	Ability to provide functional and technological interchangeability of structural elements of aircrafts.
7 – Program learning results	
PR 1	Easily communicate verb and in writing in official and foreign languages on professional problems.
PR 2	Understand environmentally dangerous and harmful factors of professional activity and correct its content in order to prevent negative impact on the environment.
PR 3	Have the means of modern information and communication technologies to the extent sufficient for training and professional activities.
PR 4	Explain their decisions and the basis for their adoption to specialists and non-specialists in a clear and unambiguous form.
PR 5	Have the skills of self-study and autonomous work to improve professional skills and solve problems in a new or unfamiliar environment.

PR 6	To form substantiated assessments of the state bodies actions and other political institutions from the standpoint of universal, democratic values, the priority of civil rights and freedoms of human and citizen.
PR 7	Have the logic and methodology of scientific knowledge, based on an understanding of the current state and methodology of the subject area.
PR 8	Comply with the requirements of industry regulations regarding procedures for the design, manufacture, testing and (or) certification of elements and objects of aviation and rocket-space technology at all stages of their life cycle.
PR 9	Explain the influence of structural parameters of elements of aviation and rocket-space technology on its flight characteristics. Have an idea of the methods of ensuring the stability and controllability of aviation and rocket-space technology.
PR 10	Have the skills to determine the loads on the structural elements of aviation and rocket-space technology at all stages of its life cycle.
PR 11	Understand the principles of fluid and gas mechanics, in particular, hydraulics, aerodynamics (gas dynamics).
PR 12	To describe the structure of the metals and non-metals and know the methods of modifying their properties. Assign optimal materials for elements and systems of aviation and space technology, taking into account their structure, physical, mechanical, chemical and operational properties, and also economic factors.
PR 13	Understand the features of work processes in hydraulic, pneumatic, electrical and electronic systems used in aero-space technology.
PR 14	To describe the experimental methods of investigation the structural, physical-mechanical and technological properties of materials and structures.
PR 15	Apply in professional activities modern methods of design, constructing and production of elements and systems of aviation and rocket-space technology objects.
PR 16	Analyse the stress-strain state, determine the strength of structural elements and the reliability of aviation and rocket-space technology systems.
PR 17	Understand and justify the sequence of design, manufacture, testing and (or) certification of elements and systems of aviation and rocket-space technology.
PR 18	Understand the structure and operation principles of onboard and navigation equipment of aviation and rocket-space technology.
PR 19	Understand and substantiate the design features and basic aspects of the work processes in systems and elements of aviation and rocket-space technology.
PR 20	Understand the theoretical principles and practical methods of instrumental of ensuring of interchangeability of parts of aviation and rocket-space technology.
PR 21	Develop technological processes, including the use of computer-aided design of the production of structural elements and systems of aviation and rocket-space technology.
PR 22	Evaluate the economic efficiency of aviation and rocket-space technology elements and systems production.
PR 23	Based on the results of aerodynamic analysis of prototypes, choose the best option of aerodynamic configuration of the aircraft.
PR 24	Simulate the aircraft structure using finite elements. Determine, on the basis of results of the stress-strain state, by the finite element analysis, the conformity of the structure or its elements to the strength conditions of this type of aircraft.
PR 25	Develop the applications for the fast execution of non-standard calculations or analysis of large data arrays contained in files whose structure is not perceived by existing CAE-systems.
PR 26	Develop schemes and determine the types of elements of mechanical systems of aircraft, develop its structures.
PR 27	Analyze the results of wind-tunnel aerodynamic test, and use them to determine the optimal aerodynamic configuration of the aircraft and its elements.

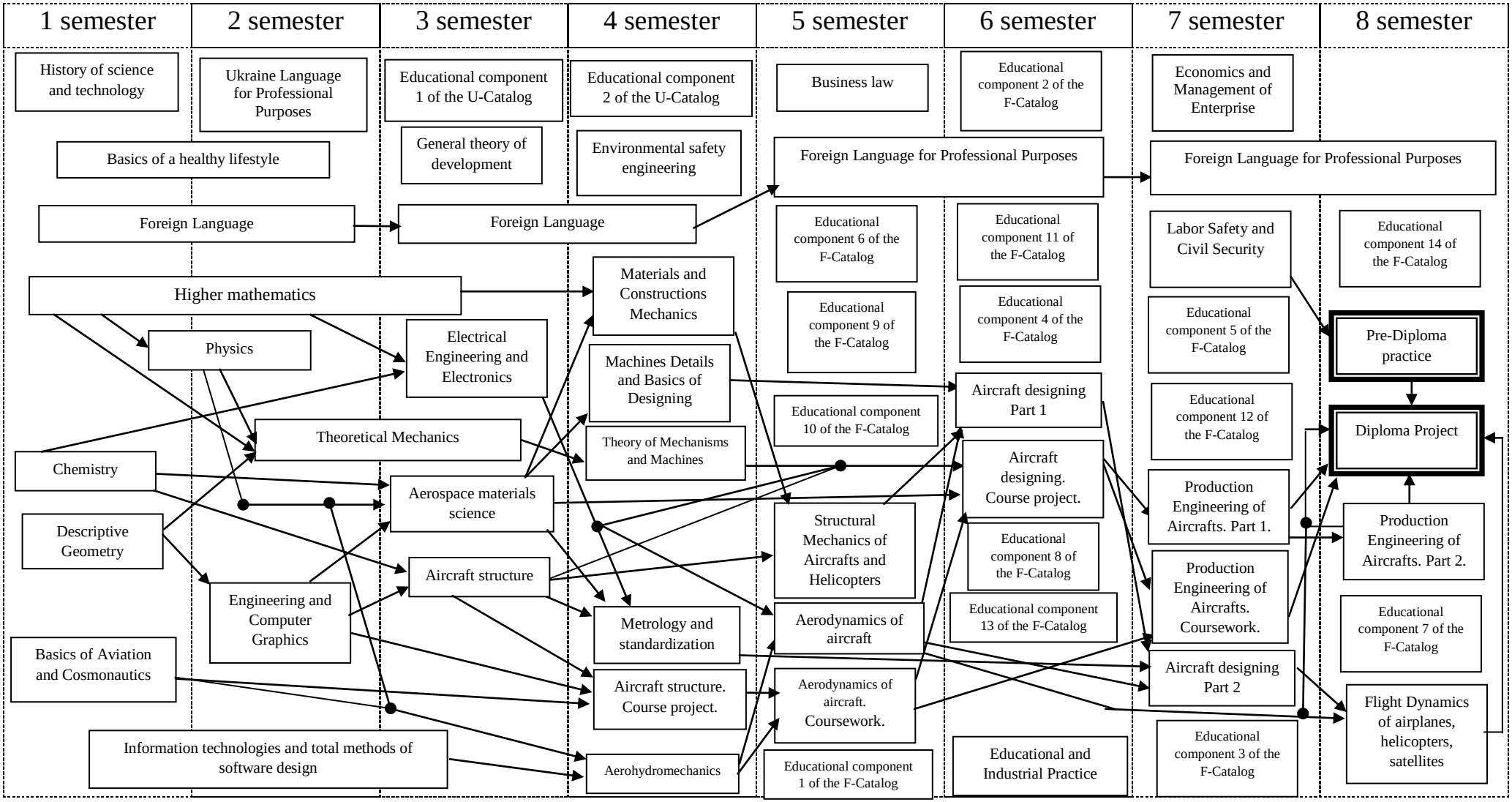
8 – Resource support for program implementation	
Staffing	At the graduate department, 9 full-time scientific and pedagogical workers (including internal part-time workers), 7 scientific and pedagogical workers who work part-time (external part-time workers) teach according to the educational program; as part of the scientific and pedagogical staff of the graduation department, 3 doctors of technical sciences, 7 candidates of technical sciences, 2 teachers have a foreign language certificate of level B2. 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 dated 12.30.2015. No. 1187 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 December 2015. 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 accordance's 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 December 2015.
9 – Academic mobility	
National credit mobility	An exchange agreement has been concluded with Dnipro National University.
International credit mobility	A double diploma and student and specialist exchange agreement has been signed with the Risen International Culture Exchange Center (China).
Training of foreign applicants for higher education	The training of English-speaking students are make in separate academic groups, at this Ukrainian language is studied as a foreign language, or with Ukrainian language when studying in joint academic groups with Ukrainian-speaking applicants.

2. The list of educational program components

Code	Components of the educational program (subjects, course projects/works, practices, qualification work)	ECTS Credits	Form of final control
1	2	3	4
1. NORMATIVE EDUCATION COMPONENTS			
1.1. General training cycle			
GN 1	Ukraine Language for Professional Purposes	2	Test
GN 2	History of science and technology	2	Test
GN 3	Basics of a healthy lifestyle	3	Test
GN 4.1	Foreign Language. Part I	3	Test
GN 4.2	Foreign Language. Part II	3	Test
GN 5	Economics and Management of Enterprise	4	Test
GN 6	Labor Safety and Civil Security	4	Test
GN 7	General theory of development	2	Test
GN 8	Environmental safety engineering	2	Test
GN 9	Business law	2	Test
GN 10.1	Foreign Language for Professional Purposes. Part I	3	Test
GN 10.2	Foreign Language for Professional Purposes. Part II	3	Exam
1.2. Vocational training cycle			
VN 1	Basics of Aviation and Cosmonautics	3	Test
VN 2.1	Higher mathematics. Part 1. Differential calculus. Analytic geometry. Linear algebra	7	Exam
VN 2.2	Higher mathematics. Part II. Integral calculus	7	Exam
VN 2.3	Higher mathematics. Part III. Differential equations. Analytical functions	4	Exam
VN 3.1	Physics. Part I. Mechanics. Molecular physics. Electrostatics.	5	Exam
VN 3.2	Physics. Part I. Magnetism. Optics. Atomic physics	5	Exam
VN 4	Chemistry	3	Test
VN 5.1	Theoretical Mechanics. Part I. Statics. Kinematics	6	Exam
VN 5.2	Theoretical Mechanics. Part II. Dynamics	4	Exam
VN 6	Aerospace materials science	4	Test
VN 7	Metrology and standardization	4	Test
VN 8	Descriptive Geometry	4	Exam
VN 9	Engineering and Computer Graphics	4	Test
VN 10	Theory of Mechanisms and Machines	4	Exam
VN 11	Electrical Engineering and Electronics	3	Test
VN 12	Machines Details and Basics of Designing	5	Exam
VN 13	Materials and Constructions Mechanics	3	Test
VN 14	Structural Mechanics of Aircrafts and Helicopters	4,5	Exam
VN 15	Aircraft structure	6,5	Exam
VN 16	Aircraft structure. Course project	1,5	Test
VN 17.1	Aircraft designing. Part I. Designing of structural elements	4	Exam
VN 17.2	Aircraft designing. Part II. Designing of prefabricated structures	3,5	Exam
VN 18	Aircraft designing. Course project	1,5	Test
VN 19	Aerohydromechanics	7	Exam
VN 20	Aerodynamics of aircraft	5	Exam

1	2	3	4
VN 21	Aerodynamics of Aircraft. Coursework	1	Test
VN 22.1	Production Engineering of Aircrafts. Part I. Production of structural elements	4	Exam
VN 22.2	Production Engineering of Aircrafts. Part II. Production of prefabricated structures	3,5	Test
VN 23	Production Engineering of Aircrafts. Coursework	1	Test
VN 24.1	Information technologies and total methods of software design. Part I. Information technologies	3	Test
VN 24.2	Information technologies and total methods of software design. Part II. Basics of industrial programming	3	Test
VN 24.3	Information technologies and total methods of software design. Part III. Software development for solving engineering tasks	3	Test
VN 25	Flight Dynamics of airplanes, helicopters, satellites	5	Exam
VN 26	Educational and Industrial Practice	3	Test
VN 27	Pre-Diploma practice	6	Test
VN 28	Diploma Project	6	Defense
2. ELECTIVE EDUCATION COMPONENTS			
2.1. General training cycle (Elective education components from University catalogue)			
GE 1	Educational component 1 of the U-Catalog	2	Test
GE 2	Educational component 2 of the U -Catalog	2	Test
2.2. Vocational training cycle ((Elective education components from Faculty catalogue)			
VE 1	Educational component 1 of the F-Catalog	4	Test
VE 2	Educational component 2 of the F-Catalog	4	Test
VE 3	Educational component 3 of the F-Catalog	4	Test
VE 4	Educational component 4 of the F-Catalog	4	Test
VE 5	Educational component 5 of the F-Catalog	4	Test
VE 6	Educational component 6 of the F-Catalog	4	Test
VE 7	Educational component 7 of the F-Catalog	4	Test
VE 8	Educational component 8 of the F-Catalog	4	Test
VE 9	Educational component 9 of the F-Catalog	4	Test
VE 10	Educational component 10 of the F-Catalog	4	Test
VE 11	Educational component 11 of the F-Catalog	4	Test
VE 12	Educational component 12 of the F-Catalog	4	Test
VE 13	Educational component 13 of the F-Catalog	4	Test
VE 14	Educational component 14 of the F-Catalog	4	Test
Total **in Normative components:**		**180**	
Total **in Optional components:**		**60**	
The amount of educational components **that provide the acquisition competencies defined**		**120**	
TOTAL		**240**	

3. Structural and logical scheme of educational program



4. Form of graduation certification of higher education applicants

Graduation certification of applicants for higher education under the educational program "Airplanes and Helicopters" is carried out in the form of defense of the diploma project and ends with the issuance of a standard document on awarding him a bachelor's degree with a qualification: Bachelor in Aviation and Aerospace Technologies.

Graduation certification is open and public.

The qualification work is checked for plagiarism and after the defense is placed in the repository of STL University for free access.

5. Matrix of accordance of program competences to components of the educational program

	GN 1	GN 2	GN 3	GN 4	GN 5	GN 6	GN 7	GN 8	GN 9	GN 10	VN 1	VN 2	VN 3	VN 4	VN 5	VN 6	VN 7	VN 8	VN 9	VN 10	VN 11	VN 12	VN 13	VN 14	VN 15	VN 16	VN 17	VN 18	VN 19	VN 20	VN 21	VN 22	VN 23	VN 24	VN 25	VN 26	VN 27	VN 28
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GC 2				+						+																												
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6. Matrix of procuring program outcomes of learning to relevant components of educational program

	GN 1	GN 2	GN 3	GN 4	GN 5	GN 6	GN 7	GN 8	GN 9	GN 10	VN 1	VN 2	VN 3	VN 4	VN 5	VN 6	VN 7	VN 8	VN 9	VN 10	VN 11	VN 12	VN 13	VN 14	VN 15	VN 16	VN 17	VN 18	VN 19	VN 20	VN 21	VN 22	VN 23	VN 24	VN 25	VN 26	VN 27	VN 28
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