MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
National Aerospace University
"Kharkiv Aviation Institute"

APPROVED BY
The Academic Council of
National Aerospace University
"Kharkiv Aviation Institute"
Chairman of the Academic Council
_____
«__» 201_, protocol No. ___

EDUCATIONAL AND PROFESSIONAL PROGRAM

Aircraft Designing

The first (bachelor's) level of higher education

in specialty 134 Aerospace Engineering

field of study 13 Mechanical Engineering

Qualification: Bachelor in Aerospace Engineering

in the educational program "Aircraft Designing"

The educational program is put into operation
from "01"_____ 201_

Rector of the National Aerospace University "Kharkiv Aviation Institute"
_____ M.V. Nechyporuk
order No. ___ from "__" _____ 201_

Kharkiv 201_

PREFACE

Educational and professional program "Aircraft Designing" in specialty 134 Aerospace Engineering for training of bachelors is developed by the working group of the National Aerospace University "Kharkiv Aviation Institute" consisting of:

a) project team:

1	Guarantor of the educational program	V.I. Riabkov _____ (signature)	- Dr. Tech. Sciences, Professor, Professor of Aircraft Designing Department
2	Project team members:	O.G. Hrebenikov _____ (signature)	- Dr. Tech. Sciences, Professor, Head of the Aircraft Designing Department
3		A.M. Humennyi _____ (signature)	- PhD in Tech. Sciences, Associate Professor, Associate Professor of Aircraft Designing Department

b) members of the working group:

1	A. S. Chumak	- Senior lecturer at the Aircraft Designing Department
2	O.V. Mamyna	- Leading Engineer, Secretary of the Aircraft Designing Department

Reviews of external stakeholders (if available):

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2
3

INTRODUCTION

According to Art. 1 "Basic terms and their definitions" of the Law of Ukraine "On Higher Education" from 01.07.2014 No. 1556-VII (as amended) educational program is a system of educational components at the appropriate level of higher education within the specialty that determines the requirements for the level of education persons who can start studying under this program, the list of disciplines and the logical sequence of their study, the number of ECTS credits required for this program, as well as the expected learning outcomes (competencies) that must be mastered by the applicant.

The educational program is used during:

- ACCREDITATION of the educational program, inspection of educational activity by specialty and specialization;
- Development of curriculum, syllabuses and practices;
- Development of diagnostic tools for the higher education quality;
- Determining the content of training in the system of retraining and advanced training;
- Professional orientation of applicants for the specialty.

The educational and professional program takes into account the requirements of the Law of Ukraine "On Higher Education" dated 01.07.2014 No. 1556-VII (as amended), the Resolution of the Cabinet of Ministers of Ukraine "On approval of the National Qualifications Framework" dated 23.11.2011 No. 1341 and establishes:

- Volume and term of study of bachelors;
- General competencies;
- Professional competencies;
- Program learning outcomes;
- The list and volume of academic disciplines for mastering the competencies of the educational and professional program;
- Requirements for the structure of academic disciplines.

Educational and professional program is used for:

- Drawing up curricula and working curricula;
- Formation of individual plans of students;
- Formation of working programs of academic disciplines, practices;
- determination of the information base for the formation of diagnostic tools;
- Accreditation of educational and professional program;
- Internal and external quality control of trainees;
- Certification of bachelors in the educational and professional program "Aircraft Designing" in specialty 134 "Aerospace Engineering".

Users of the educational and professional program:

- Applicants for higher education studying at the National Aerospace University “Kharkiv Aviation Institute”;
- Scientific and pedagogical workers who train bachelors in the educational and professional program "Aircraft Designing" in the specialty 134 "Aerospace Engineering";
- Examination commission of specialty 134 "Aerospace Engineering";
- Admissions Committee of the National Aerospace University “Kharkiv Aviation Institute”.
- The educational and professional program extends to the departments of the University involved in the training of bachelor's degree specialists in the educational and professional program "Aircraft Designing" in the specialty 134 "Aerospace Engineering".

1 REGULATORY REFERENCES

The educational and professional program is developed on the basis of the following regulations and recommendations:

1.1 Law of Ukraine "On Higher Education". No. 1556-UII dated 01.07.2014 (as amended).

1.2 Resolution of the Cabinet of Ministers of Ukraine "On approval of the National Qualifications Framework" dated 23.11.2011 No. 1341.

1.3 Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of branches of knowledge and specialties in which the training of higher education seekers" from 29.04.2015 No. 266.

1.4 Resolution of the Cabinet of Ministers of Ukraine "On approval of the Regulations on the procedure for exercising the right to academic mobility" dated 12.08.2015 No. 579.

1.5 National Classifier of Ukraine. Classifier of professions DK 003: 2010, approved by the order of Derzhspozhyvstandart of Ukraine dated 28.07.2010 No. 327 (as amended).

1.6 Methodical recommendations for the development of standards of higher education, approved by the higher education sector of the Scientific and Methodological Council of the Ministry of Education and Science of Ukraine, minutes of 29.03.2016 No. 3

1.7 Regulations "On the organization of the educational process" SUYA KHAI-NOV-P/005: 2016 of the National Aerospace University “Kharkiv Aviation Institute”, approved by the Academic Council of the University from 18.05.2016, protocol No. 10.

1.8 A Tuning Guide to Formulating Degree Program Profiles Including Program Competences and Program Learning Outcomes. - Bilbao, Groningen and The Hague, 2010.

1.9 A TUNING-AHELO conceptual framework of expected / desired learning outcomes in engineering. OECD Education Working Papers, No. 60, OECD Publishing 2011.http: //dx.doi.org/10.1787/5kghtchn8mbn-en

1.10 Development of educational programs. Methodical recommendations / Author: V.M. Zakharchenko, V.I. Lugovyi, Y.M. Rashkevych, Z. V. Talanova / Ed. V.G. Kremen. - Kyiv: State Enterprise "Priorities", 2014. - 120 p.

1.11 Order of the Ministry of Education and Science of Ukraine "On the peculiarities of the introduction of the list of field of study and specialties for which higher education students are trained, approved by the Cabinet of Ministers of Ukraine dated April 29, 2015 No. 266" dated 06.11.2015 No. 1151.

1.12 Classification of economic activities: DK 009:2010. - Valid from 01.01.2012. - (National Classifier of Ukraine).

1.13 Classifier of professions: DK 003: 2010. - Valid from 01.11.2010. - (National Classifier of Ukraine).

1.14 National educational glossary: higher education / 2nd ed., Revised. and ext. / Author-compiler: V.M. Zakharchenko, S.A. Kalashnikov, V. I. Lugovyi, A. V. Stavytskyi, Y. M. Rashkevich, Z. V. Talanova / Ed. V.G. Kremen. - Kyiv: Pleiades Publishing House LLC, 2014. - 100 p.

2 PROFILE OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM "AIRCRAFT DESIGNING" IN SPECIALTY 134 "AEROSPACE ENGINEERING".

1 - General information	
Full name of the higher educational institution and structural subdivision	National Aerospace University “Kharkiv Aviation Institute” Aircraft Designing Department.
Degree of higher education and title of qualification in the original language	Degree of higher education - bachelor Qualification: Mechanic, design technician (mechanics)
The official name of the educational and professional program	"Aircraft Designing"
Type of diploma and scope of educational and professional program	Bachelor's degree, single, 240 ECTS credits, study period is 3 years 10 months
Availability of accreditation	Certificate of accreditation: Series UD No. 21001693 dated 20.02.2018, issued on the basis of the order of the Ministry of Education and Science of Ukraine No. 2642l dated 15.07.2014. Accreditation period: 10 years. (initial accreditation in 1999).
Cycle / level	The first (bachelor's) level NQF of Ukraine - level 6, FQ-EHEA - first cycle, QF-LLL - level 6
Prerequisites	A person has the right to obtain a bachelor's degree, provided that there is a complete general secondary education, based on the results of external independent assessment (entrance examinations)
Language (s) of training	The language of training is the state language. In order to create conditions for international academic mobility, it may be decided to teach one or more disciplines in English and/or other foreign languages, while ensuring the knowledge of students of the discipline in the state language.
Validity of the educational and professional program	Before the introduction of a new educational program
Internet address of the permanent placement of the description of the educational and-professional program	http://k103.khai.edu/ru/site/osvitnya-programa-navchan.html
2 - The purpose of the educational program	
1 To provide theoretical knowledge and practical skills sufficient for successful performance of professional duties under the educational and professional program "Aircraft Designing" in specialty 134 "Aerospace Engineering". 2 Formation of the personality of the expert capable to use professional knowledge and practical skills to solve complex specialized problems and practical problems in aviation industry.	
3 - Characteristics of the educational and professional program	

Subject area	**Objects of study** - phenomena and problems related to the stages of creation of aerospace engineering objects. **The purpose of training** - acquisition of competencies sufficient to solve specialized and practical tasks related to the development and production of aerospace engineering objects. **Theoretical content of the subject area** - concepts and principles of physical processes, mechanics of deformed solids, technical mechanics, hydraulics, aero- and gas dynamics, thermophysics and electrical engineering, design of aircraft elements. **Methods, techniques and technologies** - analytical, numerical and experimental methods of research of problems of the subject area, in particular integrated computer technologies, methods and technologies connected with stages of development and production of aerospace engineering objects. **Tools and equipment** - laboratory equipment with measuring instruments, in particular hydraulic stands, wind tunnels, equipment for research of material properties, stress-strain state of structures; training laboratories for the study of aircraft structures, equipment used for the manufacture, assembly and testing of aerospace engineering objects; computers with information and specialized software, including computer calculation systems, geometric modeling, finite element analysis, integrated design and production of aerospace engineering objects.
Orientation of the educational-professional program	The educational and professional bachelor's degree program is designed for students who aspire to become specialists in the field of design and manufacture of aircraft.
The main focus of the educational and professional program (specialization)	The educational and professional program establishes qualification requirements for social and production activities of graduates of higher education institutions in the specialty 134 "Aerospace Engineering" of the "bachelor" educational degree and state requirements for the properties and qualities of a person who has obtained a certain educational level of the relevant professional direction in the educational and professional program "Aircraft Designing".
Features of the program	The educational program is aimed at studying the design and methods of creating aircraft made of modern materials, using information technology. The internship is conducted at enterprises that manufacture and operate aircraft.
4 - Suitability of graduates for employment and further study	
Suitability for employment	Professional activity as a specialist in the design and manufacture of aerospace engineering objects. Graduates can work in professions according to the National Classification of Occupations DK 003:2010: Section 3 - Specialists. Subsection 31 - Technical specialists in the field of applied sciences and technology. Class 311 - Technical specialists in the field of physical sciences and technology. Subclass 3115 - Technical specialists - mechanics. The specialist is trained to work in the field of "Aerospace Engineering" according to the classification of economic activities according to DK 009-2010: Section C – Manufacturing industry. Section 30 - Manufacture of other transport equipment Group 30.3 - Manufacture of air and spacecraft, related equipment Class 30.30 - Manufacture of aircraft and spacecraft, related equipment. The specialist is able to perform the specified professional work and may hold the primary positions provided for in the staff list for professional purposes, such as:

	ZKPPTR CODE (All-Union classifier of professions, positions and tariff categories) - 23485 Mechanic ZKPPTR code - 24971 Technician-Designer (Mechanics) ZKPPTR code - 25041 Technician-Technologist (Mechanics) The specialist is trained to work according to the International Standard Classification of Occupations 2008 (ISCO-08)): Major Group - 2 Professionals. Sub-major Group - 21 Science and Engineering Professionals. Minor Group - 214 Engineering Professionals (excluding Electrotechnology). Unit Group - 2144 Mechanical Engineers. Places of employment: research, design, manufacturing, public and private enterprises engaged in the development and creation of aircraft.
Further training	Continuation of education at the second (master's) level to obtain the Master's degree.
5 - Teaching and assessment	
Teaching and learning	Student-centered learning, self-study, problem-oriented learning aimed at the development of critical and creative thinking, learning through laboratory and industrial practice, dual, distance education and more. Lectures, multimedia lectures, laboratory work, seminars, practical classes in small groups, independent work based on textbooks and abstracts, consultations with teachers, preparation of a bachelor's thesis project.
Evaluation	Written exams, practice reports, essays, presentations, current (modular) control, bachelor's thesis project and its defense.
6 - Program competencies	
Integral competence	Ability to solve complex specialized and practical problems associated with the creation of aerospace engineering structures, which involves the application of theories and methods of mechanical engineering, and is characterized by complexity and uncertainty of conditions.
General competence (GC)	GC 1. Knowledge and understanding of the subject area and understanding of professional activity. GC 2. Ability to abstract thinking, analysis and synthesis. GC 3. Creativity, initiative, entrepreneurship and ability to work in a team. GC 4. Ability to assess and ensure the quality of work performed. GC 5. Forecasting the consequences of their activities from the standpoint of unacceptable deterioration of the environmental situation and the emergence of danger to human health. GC 6. Internal need for purposeful improvement of professional knowledge and skills during training and professional activity. GC 7. Practical use of modern Ukrainian language in the field of business and professional (scientific and technical) communication. GC 8. Practical use of a foreign language in the social and professional spheres of communication.
Professional competencies of the specialty (PC)	PC 1. The use of mathematical apparatus in solving problems in the field of design and manufacture of structures. PC 2. Ability to describe the interaction of bodies with each other, as well as with the gaseous and hydraulic environment on the basis of basic knowledge in the main sections of physics, mechanics, electrostatics, electrodynamics, optics, aerohydrodynamics. PC 3. Ability to set and solve problems of designing the parameters of products and processes of their production; PC 4. Ability to assess the load on the structural elements based on the conditions

	of their operation; PC 5. Ability to calculate the elements of aerospace engineering, including composite materials using knowledge in the field of mechanics and strength of materials and structures. PC 6. Design the main structural elements of aerospace engineering (spars, skin, ribs, etc.); PC7. To make a qualified choice of the class of materials for parts and products of aerospace engineering based on the knowledge of the basics of the structure of metals and non-metals and methods of modification of their properties. PC8. Ability to perform experiments to determine the properties of materials, as well as to describe, analyze and critically evaluate experimental data. PC9. Ability to use appropriate software (programming languages, packages) for physical and mathematical calculations in the field of design and manufacture of aircraft structures PC 10 Have awareness in the field of economics and management of the aerospace industry PC 11. Ability to develop typical production processes for manufacturing the elements of aerospace engineering. PC 12. Develop technical and design documentation for the manufacture of basic elements of aerospace engineering
7 - Program learning outcomes	
	PLO 1. Ability to mathematical and logical thinking, knowledge of basic concepts, ideas and methods of fundamental mathematics and the ability to use them in solving specific problems PLO 2. Assessment of modern processes and problems of social development from the standpoint of the natural science nature of society PLO 3. Knowledge of the basics of the structure of metals and non-metals and methods of modification of their properties and to make a qualified choice of class of materials for parts and products of aerospace engineering; PLO 4. Knowledge of modern information and communication technologies to the extent sufficient for training and professional activities. PLO 5. Normalization of load on aircraft units using mission requirements, layout diagrams, technical and reference literature, computers in accordance with standard calculation methods PLO 6. Calculate the stress-strain state, determine the bearing capacity of structural elements of aerospace engineering objects. PLO 7. Calculations of planar mechanisms with rotating and translational kinematic pairs of aerospace engineering products on the basis of schemes and sketch projects with the use of technical and reference literature, design automation tools, according to standard calculation methods PLO 8. Calculations of joints and connections of aerospace engineering products on durability on the basis of schemes and sketch projects with use of technical and reference literature, means of automation of designing, according to standard methods of calculations PLO 9. Describe experimental methods for studying the structural, physical-mechanical and technological properties of materials, as well as non-destructive methods of quality control. PLO 10. Carry out design calculations of aerospace engineering components from composite materials, that the structures of composite materials, shanks and rods, beams and spars, shells and panels using mathematical models of basic elements, typical design and engineering solutions and optimization techniques taking into account theoretical drawings, external and internal loads, properties of

	construction materials, in accordance with the norms of strength and regulatory documentation using a computer PLO 11. Awareness in the field of theoretical and instrumental support of interchangeability of parts, accuracy and quality of surface treatment of parts of aerospace engineering. PLO 12. To show abilities and skills concerning development of technological processes of production and selection of technological equipment, calculation of need for materials for typical constructive elements of aerospace engineering of parts. PLO 13. Describe the sequence of calculating the economic efficiency of production of elements and systems of aerospace engineering. PLO 14. Development of design documentation, sections of explanatory notes of sketch projects of medium complexity of elements of aerospace engineering products and construction of drawings by existing methods on the basis of normative documents and current standards, including using automation of design works.
8 - Resource support for program implementation	
Staffing	Research and teaching staff involved in the teaching of professionally oriented disciplines have academic degrees and/or academic titles and meet licensing requirements.
Material and technical software	Training is carried out in training laboratories, computer classes of the Aircraft Designing Department of the National Aerospace University “Kharkiv Aviation Institute”.
Information and methodical support	The use of virtual learning environment of the National Aerospace University “Kharkiv Aviation Institute” and author's developments of the teaching staff.
9 - Academic mobility	
National credit mobility	Based on bilateral agreements between the National Aerospace University “Kharkiv Aviation Institute” and technical institutions of Ukraine.
International credit mobility	Based on bilateral agreements between the National Aerospace University “Kharkiv Aviation Institute” and educational institutions of partner countries.
Training of foreign applicants for higher education	Education of foreign citizens is carried out in the state or English languages.

3 LIST OF COMPONENTS OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM (EPC) AND THEIR LOGICAL SEQUENCE

3.1 List of EP components

EPC code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Final control form
1	2	3	4
Mandatory components of the EP			
MC1	Foreign Language	7	graded assessment
MC2	History and culture of Ukraine	3	assessment
MC3	Selective humanities discipline	3	assessment
MC4	Ukrainian language (for professional purposes)	3	assessment
MC5	Philosophy	3	assessment
MC6	Engineering materials science	3	exam
MC7	Higher mathematics	17.5	exam
MC8	Electrical engineering	3	assessment
MC9	Descriptive geometry	4	exam
MC10	Programming and calculation methods	4.5	exam
MC11	Theoretical mechanics	8	exam
MC12	Thermodynamics and heat transfer	3.5	assessment
MC13	Physics	10.5	exam
MC14	Chemistry and basics of ecology	3	assessment
MC15	Engineering basics of aerospace engineering	3	assessment
MC16	Engineering and computer graphics	6	graded assessment
MC17	Aviation materials science	4	exam
MC18	Interchangeability and standardization	3	assessment
MC19	Machine parts and basics of design	5	exam
MC20	Machine parts and basics of design (CP)	2	graded assessment
MC21	Business Economics	4	assessment
MC22	Mechanics of materials and structures	9	exam
MC23	Theory of mechanisms and machines	3.5	assessment
MC24	Theory of mechanisms and machines (CP)	2	graded assessment
MC25	Technologies of construction materials	6	exam, assessment
MC26	Introductory practice	3	assessment
MC27	Educational practice	3	assessment
MC28	Internship	3	assessment
MC29	Bachelor's thesis project	9	defense of a bachelor's thesis project
The total amount of mandatory components:		**141.5**	

Selective components of OP			
Selective block 1			
SB1.1	Aerohydrodynamics	4.5	exam
SB1.2	Construction mechanics	8.5	exam

SB1.3	Hydraulics	3	assessment
SB1.4	Aerohydrodynamics of aircraft	4	exam
SB1.5	General arrangement of aerospace engineering	7	exam
1	**2**	**3**	**4**
SB1.6	Modeling of aircraft objects	4.5	assessment
SB1.7	Design of aircraft elements	8	exam
SB1.8	Design of aircraft elements	7	exam
SB1.9	Design of aircraft elements (CP)	2	graded assessment
SB1.10	Strength of aircraft	5.5	exam
SB1.11	Strength of aircraft (CP)	2	graded assessment
SB1.12	Flight dynamics	5	exam
SB1.13	Aircraft engines	4	assessment
SB1.14	Design of aircraft power plants	6.5	exam
SB1.15	Systems and equipment of aircraft	4	assessment
SB1.16	Aircraft production technologies	6.5	exam
SB1.17	Aircraft production technologies	3	assessment
SB1.18	Integrated computer-aided design technologies	4.5	assessment
SB1.19	Design of composite structures	4	exam
SB1.20	Aircraft maintenance	5	exam
Selective block 2			
SB2.1	Aerodynamics	4.5	exam
SB2.2	Theory of composite structures	8.5	exam
SB2.3	Hydrodynamics	3	assessment
SB2.4	Composite structures' strength analysis	6	exam
SB2.5	Methods for determination of composite structures' quality	5.5	exam
SB2.6	Applied programming in engineering	6	assessment
SB2.7	Calculation of composite materials' properties	6	exam
SB2.8	Composite mechanics	4	exam
SB2.9	Design of composite structures (CP)	2	graded assessment
SB2.10	Applied methods of engineering analysis	4	exam
SB2.11	Features of designing of aircraft structures' joints	5	exam
SB2.12	Physical chemistry of polymer composites	4	exam
SB2.13	Design of composite structures	4	exam
SB2.14	Production of composite structures	9	exam
SB2.15	Composite mechanics	3.5	assessment
SB2.16	Applied programming in engineering	6	exam
SB2.17	Computer systems for composite structures' calculation	6	assessment
SB2.18	Strength of composite products	4	exam
SB2.19	Methods for determination of composite structures' quality	5.5	exam
SB2.20	Production of composite structures (CP)	2	graded assessment
The total amount of selective components:		**98.5**	
TOTAL VOLUME OF EDUCATIONAL PROGRAM		**240**	

3.2 Structural and logical scheme of EP

The structural and logical scheme of the educational program reflects the sequence of studying its components and is given in Appendix A. The scheme contains mandatory components and components of selective block 1, because this block for this educational program is the basic (priority). If another selective unit is selected by the applicant for higher education, the individual trajectory of study is determined and an individual plan is drawn up.

3.3 The structure of the curriculum by semesters and the content of EP components

No.	EPC code	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	professional
And the semester					
1	MC1	Foreign Language	**Goal:** provide knowledge of phonology, phonetics, morphology, syntax and stylistics, basic vocabulary of household and professional topics and basic language tools for communication. **Task:**effective implementation of acts of oral and written communication during professional communication with foreign partners: in dialogic and monologue speech; in listening and writing (abstracting; annotation; business correspondence).	GC8	
2	MC2	History and culture of Ukraine	**Goal:**providing knowledge about the essence of socio-political and state-building processes that took place in the past of Ukraine, their objective conditionality, relationships and interdependence; development of national self-consciousness, education of students' patriotic, moral and ethical beliefs, instilling in them skills of scientific analysis aimed at providing independent understanding of the laws of historical development, teaching practical skills of working with historical sources and scientific literature, developing skills to apply knowledge of Ukrainian history in everyday life activities for orientation in socio-political life, assessment of social phenomena and events. **Task:**developing an understanding of the essence of historical processes that took place in the past and are taking place today in Ukraine, their objective nature, interconnection and interdependence; development of skills to analyze and evaluate the phenomena of socio-economic and political development of Ukrainian society, the processes of state formation and cultural construction in Ukraine in the context of world history, to generalize historical material in	GC2	

			a certain system; formation of the consciousness of a citizen and a patriot; ability to navigate in the scientific periodization of history, to compare historical processes with epochs and to apply the acquired knowledge to predict social processes in Ukraine.		
3	MC7	Higher mathematics	**Goal:** mastering methods that allow analytical research of mathematical models (correctness, completeness, complexity, stability of solutions, etc.). **Task**: study of mathematical quantities, theories, methods, which in phenomena, processes, bodies make it possible to investigate the most general properties, abstracting from those properties that are not essential	GC2	PC1
4	MC9	Descriptive geometry	**Purpose**: mastering the basic principles of geometric modeling, methods of depicting spatial forms on the plane, standards of design documentation, mathematical and algorithmic foundations of computer graphics. **Objectives**: development of spatial representation and imagination, constructive-geometric thinking, ability to analyze and synthesize spatial forms and relationships, study methods of constructing various geometric spatial objects (mainly surfaces), ways to obtain their drawings at the level of graphic models and the ability to solve in these drawings, problems related to spatial objects and their dependencies.	GC1	PC1
5	MC13	Physics	**Goal:**to form students' ideas about the modern physical picture of the world, to provide knowledge about the most important principles and laws that determine the structure and simplest forms of motion of matter, thus preparing them for a quality study of general technical and special disciplines. **Task:** study of basic patterns, methods and models for further use in specialties.	GC1 GC2	PC1 PC2

6	MC14	Chemistry and basics of ecology	**Goal:** acquisition by students of the general idea of structure of objects of environment, mastering of the theory and practice of methods of the chemical and physicochemical analysis. **Task:** Acquisition by students of knowledge about features of chemical composition of natural objects; natural processes that occur with the participation of natural components, in the presence of pollutants; system of monitoring control over the condition of natural objects; indicators that determine the quality of the environment; features of chemical control of natural objects; determination of mechanisms of chemical reactions.	GC1 GC5	PC2
7	MC15	Engineering basics of aerospace engineering	**Goal:**providing information to students about the existing aerospace engineering objects, their constituent elements and principles of movement. To acquaint students with the basics of structure, creation of production of aerospace engineering objects. **Task -** study of existing types of aerospace engineering objects, their features, structure, principle of operation. Obtaining basic knowledge about aircraft and helicopters, their classification, properties and applications in the national economy.	GC1	PC4
II semester					
6	MC7	Higher mathematics	**Goal:** mastering methods that allow analytical research of mathematical models (correctness, completeness, complexity, stability of solutions, etc.). **Task**: study of mathematical quantities, theories, methods, which in phenomena, processes, bodies make it possible to investigate the most general properties, abstracting from those properties that are not essential	GC2	PC1
7	MC1	Foreign Language	**Goal:** provide knowledge of phonology, phonetics, morphology, syntax and stylistics, basic vocabulary of household and professional topics and basic language tools for communication. **Task:** effective implementation of acts of oral and written communication during professional communication with foreign partners: in dialogic and monologue speech; in listening and writing (abstracting; annotation; business correspondence).	GC8	
8	MC4	Ukrainian language (for professional purposes)	**Goal:** acquaintance with semantic and structural features of scientific style of modern Ukrainian literary language in its functional aspect. **Task:** - acquaintance with the basic concepts of	GC7	

			functional stylistics and lexicology; - acquisition of skills of practical work with scientific terms of the chosen specialty; - raising the general level of professional and language culture.		
9	MC10	Programming and calculation methods	**Goal**: acquisition by students of knowledge about the basic characteristics of the personal computer, functions and structure of the WINDOWS operating system, functions of software shells of OS; formation of skills of skilled work with the text editor Word; study of the full cycle of program development, which includes model building, algorithm development, writing program code in an integrated environment of high-level algorithmic languages, namely editing, compiling, executing, testing and documenting programs. The purpose of training is also to provide students with knowledge of computational mathematics and the basics of mathematical modeling, developing skills to adapt standard algorithms to numerical schemes for solving complex applications, effective use of special applications - MathCAD, MATLAB to solve various engineering problems. **Tasks.**. 1. To study methods of writing programs, basic algorithms, data structures. 2. Master the full cycle of program development, which includes building a model, developing an algorithm, writing program code, documenting and testing the program. 3. To study the basic algorithms of modern theory of computational methods-solutions of equations, systems of algebraic equations, numerical methods of integration, approximation of functions, solutions of ordinary differential equations, systems of ordinary differential equations. 4. Master the ways of using modern specialized application packages.	GC1 GC2	PC1 PC9
10	MC11	Theoretical mechanics	**Goal:** master the laws of classical mechanics and methods of analytical study of the mechanical motion of a material point, solid and mechanical system **Task:** study of basic concepts and laws of statics, kinematics and dynamics for use in calculations of motion and equilibrium of mechanical systems.	GC1 GC2	PC1 PC2 PC5
11	MC13	Physics	**Goal:** to form students' ideas about the modern physical picture of the world, to provide knowledge about the most important principles and laws that determine the structure and	GC1 GC2	PC1 PC2

			simplest forms of motion of matter, thus preparing them for a quality study of general technical and special disciplines. **Task:** study of basic patterns, methods and models for further use in specialties.		
12	MC16	Engineering and computer graphics	**Purpose:** mastering the basic principles of geometric modeling, methods of depicting spatial forms on the plane, standards of design documentation, mathematical and algorithmic foundations of computer graphics. **Task:** study of methods of construction of various geometric spatial objects (mainly - surfaces), ways of receiving their drawings at the level of graphic models and ability to solve the problems connected with spatial objects and their dependences on these drawings.	GC1	PC12
13	MC27	Educational practice	**Goal:** gradual development of students' skills of forming three-dimensional models on a computer **Task:** Acquaintance with algorithms of construction of three-dimensional machine-building parts and assembly drawings on personal computer. Study and use of graphic system Inventor, Compass-Graphic, for creation of graphic images, registration of design documentation. Consolidation of skills in reading and development of machine-building drawings on the basis of parts and assemblies of aerospace engineering.	GC1 GC3 GC6 GC7	PC12
III semester					
14	MC6	Engineering materials science	**Goal:**Study of functional properties of metallic and non-metallic structural materials and methods of their evaluation. Mastering the patterns of formation of properties and performance characteristics of materials in the process of their production, as well as in the production of parts or structural elements by influencing the composition, structure, shape and location of structural elements and other possible factors. **Task:** Acquisition of some skills in the selection of structural materials based on the analysis of operating conditions of parts, determining the loads on each part, analysis of production conditions of parts and opportunities to improve properties in the production process, and analysis of costs and availability of materials.	GC1 GC2	PC3 PC7 PC8
15	MC7	Higher mathematics	**Goal:** mastering methods that allow analytical research of mathematical models (correctness, completeness, complexity, stability of solutions, etc.). **Task**: study of mathematical quantities, theories, methods, which in phenomena, processes, bodies	GC2	PC1

			make it possible to investigate the most general properties, abstracting from those properties that are not essential		
16	MC8	Electrical engineering	**Goal:** formation of students' knowledge of electrical engineering laws; electrical terminology and symbolism; methods of analysis of electric, magnetic and electronic circuits; principles of operation, designs, properties, areas of application of basic electrical and electronic equipment, electrical measuring instruments; ability to experimentally determine the parameters and characteristics of typical electric machines; practical skills of engagement and control of electrical appliances and machines. **Task**: formation of a set of knowledge, skills and ideas on the basic principles of construction and application of DC electric machines and elements of technical electronics, their application in practical activities the specialty.	GC1	PC1 PC2
17	MC11	Theoretical mechanics	**Goal:** master the laws of classical mechanics and methods of analytical study of the mechanical motion of a material point, solid and mechanical system **Task:**study of basic concepts and laws of statics, kinematics and dynamics for use in calculations of motion and equilibrium of mechanical systems.	GC1 GC2	PC1 PC2 PC5
18	MC16	Engineering and computer graphics	**Purpose:** mastering the basic principles of geometric modeling, methods of depicting spatial forms on the plane, standards of design documentation, mathematical and algorithmic foundations of computer graphics. **Task:** study of methods of construction of various geometric spatial objects (mainly surfaces), ways of receiving their drawings at the level of graphic models and ability to solve the problems connected with spatial objects and their dependences on these drawings.	GC1	PC12
19	MC18	Interchange ability and standardi-zation	**Goal:** Mastering the basics of interchangeability, standardization and metrology, gaining skills in the use and compliance with standards, performing calculations of the choice of fits of typical joints. **Task:** obtaining the knowledge necessary in the process of further study at the university, and in the subsequent practical engineering activities.	GC1	PC12
20	MC22	Mechanics of materials and structures	**Goal:** to give knowledge about modern engineering methods of calculations of elements of constructions and constructions on durability, rigidity and stability. **Task:** be able to correctly choose the calculation scheme and apply the appropriate method of calculating structural elements, abstracting from those properties of a rigid body that are not essential	GC1 GC2	PC2 PC5 PC8

			in terms of stretching (compression), bending, torsion, complex deformation under static and cyclic and dynamic loading.		
IV semester					
20	MC22	Mechanics of materials and structures	**Goal:** to give knowledge about modern engineering methods of calculations of elements of constructions and constructions on durability, rigidity and stability. **Task:** be able to correctly choose the calculation scheme and apply the appropriate method of calculating structural elements, abstracting from those properties of a rigid body that are not essential in terms of stretching (compression), bending, torsion, complex deformation under static and cyclic and dynamic loading.	GC1 GC2	PC2 PC5 PC8
21	MC23	Theory of mechanisms and machines	**Goal:** formation of a system of knowledge on the theory and methodology of analysis and synthesis of typical mechanisms of aerospace engineering. **Task:** mastering the basic concepts of kinematic pairs, kinematic chains of typical mechanisms; methods of calculation of flat mechanisms; kinematic and force analyzes of mechanisms; methods and algorithms for calculating the kinematic, dynamic characteristics of mechanisms	GC1 GC2	PC2 PC5
22	MC24	Theory of mechanisms and machines (CP)	**Goal:** consolidation of knowledge gained during the study of the course "Theory of Mechanisms and Machines", gaining experience and practical skills in solving problems related to the analysis and synthesis of typical mechanisms of aviation and space technology. **Task:** calculation of one of the kinematic pairs, kinematic circuits of a typical mechanism; kinematic and force analysis of the mechanism; calculation of kinematic, dynamic characteristics of the mechanism.	GC1 GC2 GC3 GC4 GC7	PC2 PC5
23	MC25	Technolo-gies of construction materials	**Goal:** knowledge of the materiality, areas of use, physico-chemical, technological features of the processes of manufacturing blanks (parts) by treatment of metals by cutting, foundry, electroplating, hardening of surfaces of parts by deformation and other methods. **Task**: to teach to skillfully apply in practice knowledge at development of modern ways of production of blanks, parts, joints, units	GC1 GC5	PC3 PC11
24	MC12	Thermo-dynamics and heat transfer	**Goal**: acquisition of knowledge, skills and abilities that will allow to develop simplified semantic and mathematical models of thermodynamics and heat transfer processes in aerospace engineering objects. **Task**: practical realization of possibilities of thermodynamic analysis and optimization of processes of transformation of types of energy,	GC1 GC2	PC1 PC2

			definition of the maximum possible efficiency of power installations and the basic sources of losses of working capacity, calculation of a temperature condition of the simplest geometrical analogues of elements of aerospace engineering objects.		
24	MC26	Introductory practice	**Goal:** consolidation and expansion of knowledge and skills acquired during training; development of active skills of practical application of the received theoretical knowledge; to acquire the skills of mastering the basic commands of the mathematical environment Mathematica **Task:** learn to use the mathematical package Mathematica to perform computational and graphical work in the process of further training.	GC1 GC3 GC6 GC7	PC9
25	SB1.1	Aerohydro-dynamics	**Goal:** mastering the basic principles of aerohydrodynamics and gaining knowledge about the laws of motion of liquids and gases and the use of these laws to calculate the flow of bodies. **Task:**students study: the influence of different geometric and kinematic characteristics on the hydrodynamic parameters of the flow, as well as the influence of geometric parameters on the operation of pumps and units of aircraft systems; the nature of the aerodynamic forces acting on the aircraft in flight.	GC1 GC2	PC1 PC2 PC4
26	SB1.6	Modeling of aircraft objects	**Goal:** Acquisition by students of skills of designing and technological preparation of production of elements of aircraft designs with use of three-dimensional systems of the automated designing. **Task:** study of theoretical bases of automated design of aerospace products and acquisition of practical skills of modeling of aircraft structures in the CATIA V5 system	GC1 GC2	PC1 PC2 PC5 PC6
27	MC17	Aviation materials science	**Goal:**Study of functional properties of metallic and non-metallic structural materials and methods of their evaluation. Mastering the patterns of formation of properties and performance characteristics of materials in the process of their production, as well as in the production of parts or structural elements by influencing the composition, structure, shape and location of structural elements and other possible factors. **Task:** Acquisition of some skills in the selection of structural materials based on the analysis of operating conditions of parts, determining the loads on each part, analysis of production conditions of parts and opportunities to improve properties in the production process, and analysis	GC1	PC3 PC7 PC8

			of costs and availability of materials.		
V semester					
28	MC5	Philosophy	**Goal:** providing knowledge of philosophy as a worldview of man, or a set of views on the world as a whole and man's attitude to this world, in the understanding of ontological, epistemological, axiological, praxeological and social problems of existence. **Task:** **-** to form the ability of conscious, free, and hence responsible choice of personal worldviews, the ability to conduct worldview dialogue; - to show the patterns of genesis and formation of specific historical forms of philosophy; - to achieve students' mastery of philosophical ways of thinking, basic philosophical principles, mastering the worldview and humanistic content of philosophy, mastering an independent style of thinking; - to cultivate the ability to apply the acquired knowledge in their own lives, interpersonal relationships, scientific and practical activities and in the analysis of general problems of today; - to promote the assertion of humanism in society and the spiritual development of the individual.	GC2	
29	MC19	Machine parts and basics of design	**Purpose:** students' acquisition of knowledge and skills, necessary for the calculation and design of parts and components of aerospace engineering. **Task:** Study of bases of calculations and designing, criteria of serviceability of parts and joints of machines, mastering of methods of calculation of various parts, acquaintance with modern methods of designing.	GC1	PC5
30	MC25	Technolo-gies of construction materials	**Goal**: study of methods that allow to analyze and develop production processes to obtain high quality products. **Task**: study of methods for determining the elastic-plastic and thermal state of blanks or parts, optimization of process parameters, equipment selection, development of equipment and machinery, etc.	GC1 GC5	PC3
31	SB1.3	Hydraulics	**Goal:** formation of a system of knowledge on the basics of fluid dynamics and performance of hydraulic calculations. **Task:** gaining knowledge of the basics of fluid dynamics and skills in solving specific engineering problems of design, hydraulic and pneumatic devices and systems.	GC1 GC2	PC1 PC2 PC4
32	SB1.2	Construc-tion mechanics	**Goal**: obtaining knowledge about the requirements for the structures of complex multi-element load-bearing structures in general (in	GC1 GC2	PC1 PC2 PC5

			particular, thin-walled), and the features of their deformation in real operation; about the boundary states of such structures. **Task**: to teach methods of determining stresses, displacements in elements of composite structures from the action of known (given) external forces, natural frequencies and forms of oscillations of simpler elements of such structures, as well as methods of determining limit values of external action parameters leading to boundary states of structures or elements.		PC6
33	SB1.5	General arrangement of aerospace engineering	**Purpose:** to give the necessary knowledge regarding the purpose and general structure of the main units and systems of aircraft, to teach to conduct a comparative analysis of products for similar purposes, but of different design. **Task**:Gain knowledge about the general structure of aircraft, unmanned aerial vehicles, the basic requirements for them, the main types of design and load-carrying structures, their advantages and disadvantages.	GC1 GC2	PC1 PC2 PC5
	SB1.4	Aerohydrodynamics of aircraft	**Goal:** mastering the basic principles of aerohydrodynamics of aircraft and gaining knowledge about the laws of motion of liquids and gases and the use of these laws to calculate their characteristics. **Task:** students study: the influence of different geometric parameters of aircraft on their aerodynamic characteristics of the flow, as well as the influence of geometric parameters on the operation of pumps and units of aircraft systems; the nature of the aerodynamic forces acting on the aircraft in flight.	GC1 GC2 GC5	PC1 PC3 PC7 PC11 PC12
VI semester					
34	MC3	Selective humanities discipline (Political Science, Law, Psychology, Sociology, Ethics, Organizational culture and image of a modern leader)	**Goal:** assimilation of political world and domestic processes, regularities of development and functioning of political science, its place and role in a life of a society. **Task:** study the essence, history, theory and methodology of political activity and behavior, be able to navigate the main world political schools, concepts and directions, know and be able to characterize Ukrainian political doctrines, have an idea of the essence of political life, political relations and processes, the object and the subject of politics.	GC2	
35	MC20	Machine parts and basics of design (CP)	**Goal:** acquisition of knowledge and skills, consolidation of knowledge gained during the study of the course "Machine parts and basics of design", acquisition of experience and practical skills in solving problems related to the design of parts and components of aerospace engineering	GC1 GC3 GC4 GC7	PC5

			Task: calculation and design of one of the components of aircraft engines, helicopter, design of wiring of technological equipment, which is used in their manufacture.		
37	MC28	Internship	**Goal:** consolidation and expansion of knowledge and skills acquired during training; development of active skills of practical application of the received theoretical knowledge; mastering the initial professional experience; collect of material for the course project. **Task:** to study the structure of the shop (enterprise), the system of organization of the production process and maintenance of the workplace, technological equipment, equipment, materials used in the manufacture of aircraft. Get acquainted with the issues of product quality control, quality management system, occupational health and safety system, safety, environmental protection.	GC1 GC3 GC5 GC7	PC12
38	SB1.2	Construc-tion mecha-nics	**Goal**: obtaining knowledge about the requirements for the structures of complex multi-element load-bearing structures in general (in particular, thin-walled), and the features of their deformation in real operation; about the boundary states of such structures. **Task**: to teach methods of determining stresses, displacements in composite elements from the action of known (given) external forces, natural frequencies and forms of oscillations of simpler elements of such structures, as well as methods of determining limit values of external action parameters leading to limit states of structures or elements.	GC1 GC2	PC1 PC2 PC5 PC6
39	SB1.12	Flight dynamics	**Goal:** to study methods and algorithms for calculating the flight dynamics of aircraft and helicopters **Task:**study of analytical and numerical methods for calculating the flight dynamics of aircraft.	GC1 GC2	PC1 PC5 PC6
41	SB1.10	Strength of aircraft	**Goal:** training of specialists to solve engineering problems to ensure the required level of airworthiness, strength and durability that arise at the stages of design, manufacture and operation of aircraft. **Task:** students study the requirements of airworthiness standards, methods for determining compliance with regulated requirements, methods of calculating loads in flight and landing, features of calculations of stress-strain state of aircraft structures of different load-carrying structures at operating and design loads, strength and durability criteria.	GC1 GC2	PC1 PC2 PC4
42	SB1.13	Aircraft	**Goal:** provide the necessary knowledge on the	GC1	PC1

		engines	use of aircraft engines **Task:** study of parameters and characteristics of aircraft engines.	GC2	PC2 PC5 PC6 PC9
43	SB1.7	Design of aircraft elements	**Purpose:** students learn about the features of the work and interaction of parts, units' joints under the action of loads, about modern methods of construction and design of structural elements and joints of aircraft from the condition of minimum mass and taking into account the given service life. **Objectives:** students gain knowledge about modern methods of design and construction of structural elements and components of the wing, tal unit, fuselage, landing gear, control system (spars, stringers, ribs, brackets, skin, frames, joints, panels, rods of the control system, rocker levers, trays, shock-absorbers, etc.) on a condition of a minimum of weight, and principles and rules of rational designing in aircraft building, designing of detachable and non-detachable joints.	GC1 GC2	PC1 PC3 PC7 PC11 PC12
VII semester					
44	MC21	Business Economics	**Purpose of study:** to give the necessary knowledge about the economic activity of the enterprise in order to organize the production (provision of services) with maximum economic efficiency. **Task:** formation of modern managerial thinking and a system of special knowledge in the field of management and economics of the enterprise, as well as practical skills of analysis and planning of indicators of economic and production activities.	GC1	PC10
45	SB1.8	Design of aircraft elements	**Purpose:** students learn about the features of the work and interaction of parts, units' joints under the action of loads, about modern methods of construction and design of structural elements and units of aircraft from the condition of minimum mass and taking into account the given service life. **Objectives:** students gain knowledge about modern methods of design and construction of structural elements and components of the wing, tail unit, fuselage, landing gear, control system (spars, stringers, ribs, brackets, skin, frames, joints, panels, rods of the control system, rocker levers, trays, shock-absorbers, etc.) on a condition of a minimum of weight, and also principles and rules of rational designing in aircraft building, designing of detachable and not detachable joints.	GC1 GC2	PC1 PC5 PC6

46	SB1.11	Strength of aircraft (CP)	**Goal:** training of specialists to solve engineering problems to ensure the required level of airworthiness, strength and durability that arise at the stages of design, manufacture and operation of aircraft. **Task:** students study the requirements of airworthiness standards, methods for determining compliance with regulated requirements, methods of calculating loads in flight and landing, features of calculations of stress-strain state of aircraft structures of different load-carrying structures under operational and design loads, strength and durability criteria.	GC1 GC2	PC1 PC2 PC4 PC5 PC6
47	SB1.14	Design of aircraft power plants	**Goal:** give knowledge about the purpose, layout and schematics, operation and basic parameters, design of units and elements of aircraft power plants. **Task:** to study the purpose, design of aircraft power plants' elements; about the current load and operation under load; about load-carrying structures, engine mount and their comparative estimation, the applied materials; on general and special requirements of FAR/JAR/AP-23/25/27/29 for aircraft power plants and examples of their implementation; to teach engineering methods of analysis and design.	GC1 GC2 GC4	PC1 PC3
48	SB1.16	Aircraft production technologies	**Purpose:** to gain experience and practical skills in solving problems related to the manufacture of aircraft elements. **Task:** development of production process of manufacture of parts; calculation of process parameters, selection of equipment for molding and machining of parts.	GC1 GC2 GC3 GC5 GC7	PC1 PC3 PC7 PC11 PC12
VIII semester					
49	SB1.15	Systems and equipment of aircraft	**Goal**: mastering the knowledge of the principles and methods of design and manufacturing technology of aircraft. Gain the necessary knowledge about the operation, composition of systems and equipment of aircraft of different types. **Task:** to study the equipment of aircraft taking into account the requirements of aviation rules, purpose and functions of aircraft equipment, principles and methods of designing of aircraft systems and equipment, modern technologies for manufacturing systems and equipment of aircraft.	GC1 GC2 GC4	PC1 PC8

50	SB1.9	Design of aircraft elements	**Purpose:** students learn about the features of the work and interaction of parts, units' joints under the action of loads, about modern methods of construction and design of structural elements and units of aircraft from the condition of minimum mass and taking into account the given service life. **Task**: students gain knowledge about modern methods of designing and constructing elements of structures and components of the wing, tail unit, fuselage, landing gear, control system (spars, stringers, ribs, brackets, skin, frames, joints, panels, rods of the control system, rocker levers, trays, shock absorbers, etc.) on the condition of minimum weight, as well as the principles and rules of rational design in aircraft construction, design of detachable and non-detachable joints.	GC1 GC2	PC1 PC6
51	SB1.17	Aircraft production technologies	**Purpose:** to gain experience and practical skills in solving problems related to the manufacture of aircraft elements. **Task:** development of production process of manufacture of parts; calculation of production process parameters, selection of equipment for molding and machining of parts.	GC1 GC2 GC3 GC4 GC7	PC1 PC2 PC4 PC5 PC6 PC12
52	SB1.18	Integrated computer-aided design technologies	**Goal:** to gain knowledge about modern methods of design, construction and modeling of aerospace engineering objects with the help of computer integrated systems CAD/CAM/CAE. **Task:** students gain knowledge about the modern use of methods for designing aircraft structures using the CAD/CAM/CAE system.	GC1 GC2	PC1 PC2 PC4 PC5 PC6
53	SB1.19	Design of composite structures	**Goal:** studying the features of the composite in the transition zones of different nature, and presenting them as specific joints which will take into account the local nature of the material load. **Task:** calculate the adhesive and (or) multi-row joint with constant parameters; take into account the influence of the moment in the plane of the joint on the load of the adhesive and mechanical joint; assess the pliability and load-bearing capacity of the combined power connection of any structure.	GC1 GC2	PC1 PC2 PC4 PC5 PC6
54	SB1.20	Aircraft maintenance	**Goal:** mastering the basic provisions for the organization of aircraft maintenance and repair, maintaining a given level of reliability and flight safety. **Task:** mastering the scientific base in the field of organization and implementation of processes of technical operation of air transport; consolidation of previously acquired knowledge in the following disciplines: basics of aviation and	GC1 GC2	PC1 PC2 PC4 PC5 PC6

			astronautics; computer science and basics of programming; aerodynamics and flight dynamics; theory, design of aircraft and aircraft engines, etc., mastering the practical skills of the organization of maintenance and safe performance of standard maintenance work; activation of education and preparation of the student for the choice of field and specialty of practical activity in new market conditions.		
54	MC29	Bachelor's thesis project	**Goal:** determining the level of student readiness to solve a set of modern scientific and applied tasks in accordance with the generalized object of activity based on the application of a system of theoretical knowledge and practical skills acquired during the entire period of study in accordance with higher education standards. **Task:** - Systematization, consolidation and expansion of theoretical knowledge, obtained in the process of training on the educational and professional training program of a certain educational degree, and their practical use in solving specific scientific, applied, engineering, economic, social and industrial issues in a particular field of professional activity; - Development of skills of independent work, mastering the methods of research and experimentation, physical or mathematical modeling, - The use of modern information technology in the process of solving problems that are provided by the task of diploma design; - Determining the compliance of the graduate's level of training with the requirements of educational degrees, the characteristics of the specialist, his/her readiness and ability to work independently in a market economy, modern production, progress in science, technology and culture.	GC1 GC2 GC3 GC4 GC5 GC7 GC8	PC1 PC2 PC3 PC4 PC5 PC6 PC7 PC8 PC9 PC10 PC11 PC12

4 FORM OF CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Certification of graduates in the educational and professional program "Aircraft Designing" in the specialty 134 "Aerospace Engineering" is carried out in the form of defense of a bachelor's thesis project and ends with the issuance of a standard document on awarding a bachelor's degree with educational qualification: **Mechanic, Technician Designer (mechanics)**. Certification is carried out openly and publicly.

5 MATRIX OF CONFORMITY OF SOFTWARE COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM

Program competencies	Components of educational program																																													
	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17	MC 18	MC 19	MC 20	MC 21	MC 22	MC 23	MC 24	MC 25	MC 26	MC 27	MC 28	MC 29	SB1.1	SB1.2	SB1.3	SB1.4	SB1.5	SB1.6	SB1.7	SB1.8	SB1.9	SB1.10	SB1.11	SB1.12	SB1.13	SB1.14	SB1.15	SB1.16	SB1.17	SB1.18
GC 1. Knowledge and understanding of the subject area and understanding of professional activity.						+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
GC 2. Ability to abstract thinking, analysis and synthesis.		+	+		+	+	+			+	+	+	+									+	+	+					+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
GC 3. Creativity, initiative, entrepreneurship and ability to work in a team.																				+				+		+	+	+	+								+										+
GC 4. Ability to assess and ensure the quality of work performed.																				+				+					+				+				+						+				
GC 5. Forecasting the consequences of their activities from the standpoint of unacceptable deterioration of the environmental situation and the emergence of danger to human health.														+											+			+	+																	+	+
GC 6. Internal need for purposeful improvement of professional knowledge and skills during training and professional activity.																										+	+								+												
GC 7. Practical use of modern Ukrainian language in the field of business and professional (scientific and technical) communication.				+																+				+		+	+	+	+								+										+
GC 8. Practical use of a foreign language in the social and professional spheres of communication.	+																												+																		
PC 1. The use of mathematical apparatus in solving problems in the design and manufacture of composite structures.							+	+	+	+	+	+	+																+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PC 2. Ability to describe the interaction of bodies with each other, as well as with the gaseous and hydraulic environment on the basis of basic knowledge in the main sections of physics, mechanics, electrostatics, electrodynamics, optics, aerohydrodynamics.								+			+	+	+	+								+	+	+					+	+	+	+						+	+		+	+		+	+		
Program competencies	Components of the educational program																																													
	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17	MC 18	MC 19	MC 20	MC 21	MC 22	MC 23	MC 24	MC 25	MC 26	MC 27	MC 28	MC 29	SB1.1	SB1.2	SB1.3	SB1.4	SB1.5	SB1.6	SB1.7	SB1.8	SB1.9	SB1.10	SB1.11	SB1.12	SB1.13	SB1.14	SB1.15	SB1.16	SB1.17	SB1.18
PC 3. Ability to set and solve problems of designing the parameters of products and processes of their production;						+											+								+				+														+			+	+
PC 4. Ability to assess the load on the structural elements based on the conditions of their operation;															+														+	+		+						+	+					+			
PC 5. Ability to calculate the elements of aerospace engineering, including composite materials using knowledge in the field of mechanics and strength of materials and structures.											+								+	+		+	+	+					+		+					+	+	+		+	+	+		+			
PC 6. Design the main structural elements of aerospace engineering (spars, skin, ribs, etc.), including composite materials;																													+		+			+		+	+	+		+		+		+			
PC7. To make a qualified choice of the class of materials for parts and products of aerospace engineering on the basis of knowledge of the basics of the structure						+											+												+																+.	+	+

of metals and non-metals and methods of modification of their properties.																																															
PC8. Ability to perform experiments to determine the properties of materials, including pure composites, as well as to describe, analyze and critically evaluate experimental data.						+											+					+							+				+														
PC9. Ability to use appropriate software (programming languages, packages) for physical and mathematical calculations in the field of design and manufacture of composite structures										+																+			+						+						+					
Program competencies	Components of the educational program																																														
	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17	MC 18	MC 19	MC 20	MC 21	MC 22	MC 23	MC 24	MC 25	MC 26	MC 27	MC 28	MC 29	SB1.1	SB1.2	SB1.3	SB1.4	SB1.5	SB1.6	SB1.7	SB1.8	SB1.9	SB1.10	SB1.11	SB1.12	SB1.13	SB1.14	SB1.15	SB1.16	SB1.17	SB1.18
PC 10 Have awareness in the field of economics and management of the aerospace industry			+																		+								+																		
PC 11. Ability to develop typical production processes for manufacturing of elements of aerospace engineering, including composite materials.																									+				+																	+	+
PC 12. Develop technical and design documentation for the manufacture of basic elements of aerospace engineering (including composites)																+		+										+	+						+	+	+									+	+

6 MATRIX OF COMPLIANCE OF THE PROGRAM LEARNING OUTCOMES (PLO) WITH THE RELEVANT COMPONENTS OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM

Program competencies	Components of educational program																																													
	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17	MC 18	MC 19	MC 20	MC 21	MC 22	MC 23	MC 24	MC 25	MC 26	MC 27	MC 28	MC 29	SB1.1	SB1.2	SB1.3	SB1.4	SB1.5	SB1.6	SB1.7	SB1.8	SB1.9	SB1.10	SB1.11	SB1.12	SB1.13	SB1.14	SB1.15	SB1.16	SB1.17	SB1.18
PLO 1. Ability to mathematical and logical thinking, knowledge of basic concepts, ideas and methods of fundamental mathematics and the ability to use them in solving specific problems							+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PLO 2. Assessment of modern processes and problems of social development from the standpoint of the natural science nature of society		+	+		+																																										
PLO 3. Knowledge of the basics of the structure of metals and non-metals and methods of modification of their properties and to make a qualified choice of class of materials for parts and products of aerospace engineering;						+											+								+																					+	+
PLO 4. Knowledge of modern information and communication technologies to the extent sufficient for training and professional activities.										+																+									+												
PLO 5. Normalization of load on aircraft units using mission requirements, layout diagrams, technical and reference literature, computers in accordance with standard calculation methods																														+									+								
PLO 6. Calculate the stress-strain state, to determine the bearing capacity of structural elements of aerospace engineering, including composite materials.																			+	+		+									+					+	+	+		+	+	+		+			
PLO 7. Calculations of planar mechanisms with rotating and translational kinematic pairs of aerospace engineering products on the basis of schemes and sketch projects with the use of literature, automation tools, according to standard calculation methods											+													+	+						+																
Program competencies	Components of the educational program																																													
	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17	MC 18	MC 19	MC 20	MC 21	MC 22	MC 23	MC 24	MC 25	MC 26	MC 27	MC 28	MC 29	SB1.1	SB1.2	SB1.3	SB1.4	SB1.5	SB1.6	SB1.7	SB1.8	SB1.9	SB1.10	SB1.11	SB1.12	SB1.13	SB1.14	SB1.15	SB1.16	SB1.17	SB1.18
PLO 8. Calculations of joints and connections of aerospace engineering products on durability on the basis of schemes and sketch projects with use of technical and reference literature, means of automation of designing, according to standard methods of calculations																				+	+																								+		
PLO 9. Describe experimental methods for studying the structural, physical-mechanical and technological properties of materials, as well as non-destructive methods of quality control, including for structures made of composite materials.						+											+																+										+				
PLO 10. Carry out design calculations of aerospace engineering components from composite materials, that the structures of composite materials, shanks and rods, beams and spars, shells and panels using mathematical models of basic elements, typical design and engineering solutions and optimization techniques taking into account theoretical drawings, external and internal loads, properties construction materials, in accordance with the norms of strength and regulatory documentation using a computer																													+							+	+							+			
PLO 11. Awareness in the field of theoretical and instrumental support of																+		+							+				+																	+	

interchangeability of parts, accuracy and quality of surface treatment of parts of aerospace engineering.																																															
PLO 12. Show skills and abilities to develop technological processes of production and selection of technological equipment, calculation of need for materials, including composite materials.																													+																	+	+
Program competencies	Components of the educational program																																														
	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17	MC 18	MC 19	MC 20	MC 21	MC 22	MC 23	MC 24	MC 25	MC 26	MC 27	MC 28	MC 29	SB1.1	SB1.2	SB1.3	SB1.4	SB1.5	SB1.6	SB1.7	SB1.8	SB1.9	SB1.10	SB1.11	SB1.12	SB1.13	SB1.14	SB1.15	SB1.16	SB1.17	SB1.18
PLO 13. Describe the sequence of calculating the economic efficiency of production of elements and systems of aerospace engineering.																					+																									+	+

Appendix A

STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM