ID 17903

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
National Aerospace University H.E. Zhukovsky
"Kharkiv Aviation Institute"

APPROVED
Academic Council
National Aerospace University
.E. Zhukovsky
"Kharkiv Aviation Institute"

April 19, 2017, protocol № 13

EDUCATIONAL PROFESSIONAL PROGRAM

Design and manufacturing of composite structures

first (bachelor's) level of higher education
speciality 134 Aviation and rocket-space technology
Area of expertise 13 Mechanical engineering
Qualification: Bachelor in aerospace and rocket-space technology
by educational professional program «Design and manufacturing of composite structures»

(from changes made in accordance with the decision:
Academic Council KHAI protocol № 9 from 20.03.2019)

The educational program is put into operation from "01" September 2019

Rector of National Aerospace University H.E. Zhukovsky "Kharkiv Aviation Institute"
_____ N Nechyporuk
order 194 of 04.04.2019

Kharkov 2019

PREAMBLE

Educational-professional program "Design and manufacturing of composite structures" for the preparation of applicants for the first (bachelor's) level of higher education in the specialty 134 " Aviation and rocket-space technology " at the National Aerospace University H.E. Zhukovsky "Kharkiv Aviation Institute" was updated due to changes in accordance with the Standard of the Ministry of Education and Science (order of the Ministry of Education and Science № 1441 of 22.12.2018) (approved by the decision of the Academic Council of KHAI protocol № 9 of 20.03.2019).

Update of the educational and professional program "Design and manufacturing of composite structures" was carried out by the group of development and support of the EPP of the National Aerospace University H.E. Zhukovsky "Kharkiv Aviation Institute" consisting of:

1	Guarantor (head) of the educational program	M. Shevtsova _____ (signature)	– candidate of technical sciences, associate professor, head of the department of composite structures and aviation materials science
2	Members of the specialty project team:	A. Kondratiev _____ (signature)	– doctor of technical sciences, associate professor, head of the department of rocket design and engineering
3		F. Gagauz _____ (signature)	– candidate of technical sciences, associate professor of the department of composite structures and aviation materials science

members of the working group:

1	O. Ivanovska	– candidate of technical sciences, associate professor of the department of composite structures and aviation materials science
2	S. Kryvenda	– candidate of technical sciences, associate professor of the department of composite structures and aviation materials science
3	P. Gagauz	– candidate of technical sciences, associate professor of the department of composite structures and aviation materials science
4	V. Stavychenko	– candidate of technical sciences, associate professor of the department of composite structures and aviation materials science

Reviews of external stakeholders (if available):

1
2
3

INTRODUCTION

According to Art. 1 "Basic terms and their definitions" of the Law of Ukraine "On Higher Education" from 01.07.2014 № 1556-VII (as amended) educational program - 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 to implement this program. As well as the expected learning outcomes (competencies) that must be mastered by the applicant for the appropriate degree of higher education.

The educational program is used during:

- accreditation of the educational program, inspection of educational activity by specialty and specialization;
- development of curriculum, programs of academic disciplines and practices;
- development of tools for diagnosing the quality of higher education;
- determining the content of training in the system of retraining and advanced training;
- professional orientation of applicants for the specialty.

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

- volume and term of study of bachelors;
- general competencies;
- professional competencies;
- program learning outcomes;
- list and scope of academic disciplines for mastering the competencies of the educational-professional program;
- requirements for the structure of academic disciplines.

The educational- professional program is used for:

- drawing up curricula and working curricula;
- formulation of students' individual plans;
- formation of work programs in basic disciplines, practices;
- setting up the information base for the formulation of the diagnostics;
- accreditation of the educational-professional programs;
- interior and exterior quality control of training;
- certification of bachelors in the educational and professional program "Design and manufacturing of composite structures" in the specialty 134 "Aviation and rocket-space technology".

Users of the educational and professional program:

- higher education students studying at the National Aerospace University H.E. Zhukovsky “Kharkiv Aviation Institute”;
- scientific and pedagogical workers who train bachelors in the educational and professional program "Design and manufacturing of composite structures" in the specialty 134 "Aviation and rocket-space technology";
- examination commission of specialty 134 "Aviation and rocket-space technology";
- Admissions Committee of the National Aerospace University H.E. Zhukovsky “Kharkiv Aviation Institute”.
- The educational-professional program extends to the departments of the University involved in the training of bachelor's degree specialists in the educational and professional program "Design and manufacturing of composite structures" in the specialty 134 "Aviation and rocket-space technology".

1 NORMATIVE REFERENCES

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

1.1 Закон України «Про вищу освіту». № 1556-VII від 01.07.2014(зі змінами).

1.2 Постанова Кабінету Міністрів України «Про затвердження Національної рамки кваліфікацій» від 23.11.2011 р. № 1341.

1.3 Постанова Кабінету Міністрів України «Про затвердження переліку галузей знань і спеціальностей, за якими здійснюється підготовка здобувачів вищої освіти» від 29.04.2015 № 266.

1.4 Постанова Кабінету Міністрів України «Про затвердження Положення про порядІС реалізації права на академічну мобільність» від 12.08.2015 р. № 579.

1.5 Національний класифікатор України. Класифікатор професій ДК 003:2010, затверджений наказом Держспоживстандарту України від 28.07.2010 р.№ 327 (зі змінами).

1.6 Методичні рекомендації щодо розроблення стандартів вищої освіти,схвалені сектором вищої освіти Науково-методичної Ради Міністерства освітиі науки України протІСол від 29.03.2016 № 3

1.7 Положення «Про організацію освітнього процесу» СУЯ ХАІ-НОВ-П/005:2016Національного аерІСосмічного університету ім. М. Є. Жуковського «Харківський авіаційний інститут», затверджене вченою радою університету від 18.05.2016 р протІСол № 10.

1.8 A Tuning Guide to Formulating Degree Programme Profiles Including Programme Competences and Programme 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 Розроблення освітніх програм. Методичні рекомендації / Авт.: В. М. Захарченко, В. І. Луговий, Ю. М. Рашкевич, Ж. В. Таланова / За ред. В. Г. Кременя. – К. : ДП «НВЦ «Пріоритети», 2014. – 120 с.

1.11 Наказ МОН України «Про особливості запровадження переліку галузей знань і спеціальностей, за якими здійснюється підготовка здобувачів вищої освіти, затвердженого постановою Кабінету Міністрів України від 29 квітня 2015 рІСу № 266» від 06.11.2015 № 1151.

1.12 Класифікація видів економічної діяльності: ДК 009:2010. – Чинний від 01.01.2012. – (Національний класифікатор України).

1.13 Класифікатор професій: ДК 003:2010. – Чинний від 01.11.2010. – (Національний класифікатор України).

1.14 Національний освітній глосарій: вища освіта / 2-е вид., перероб. ідоп. / Авт.-уклад.: В. М. Захарченко, С. А. Калашнікова, В. І. Луговий, А. В. Ставицький, Ю. М. Рашкевич, Ж. В. Таланова / За ред. В. Г. Кременя. – К.: ТОВ «Видавничий дім «Плеяди», 2014. – 100 с.

2 PROFILE OF EDUCATIONAL PROGRAM
"Design and manufacturing of composite structures" in the specialty 134 "Aviation and rocket-space technology"

1 – General information	
Full name of the higher educational institution and structural subdivision	National Aerospace University H.E. Zhukovsky "Kharkiv Aviation Institute" Department of composite structures and aviation materials science
Higher education level and qualification in the original language	Degree – Bachelor Qualification: Bachelor in aerospace and rocket-space technology
The official name of the educational and professional program	Design and Manufacturing of Composite Structures
Diploma type and scope of educational program	Bachelor's diploma, single, 240 credits, term of study 3 years 10 months.
Availability of accreditation	Сертифікат про акредитацію: Серія УД № 21001693 від 20 лютого 2018 р., виданий на підставі наказу МОН України № 2642л від 15.07.2014.(протІСол АК № 110 від 08.07.2014 р.) Період акредитації: до 01 липня 2024р.
Cycle / level	first bachelor's level NQF of Ukraine – 7 level, FQ-EHEA – first circle, QF-LLL – 6 level).
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 lecturing	Ukrainian/English.
The validity of educational program	Until the next accreditation.
Інтернет-адреса постійного розміщення опису освітньо-професійної програми	https://khai.edu/ua/education/osvitni-programi-i-komponenti/osvitni-programi-bakalavriv/
2 – The purpose of the educational program	
1 Provide theoretical knowledge and practical skills sufficient for successful performance of professional duties under the educational-professional program "Design and manufacturing of composite structures" in the specialty 134 "Aviation and rocket-space technology". 2 Formation of the personality of the expert capable to use professional-profile knowledge and practical skills for the decision of difficult specialized problems and practical problems in various branches of a national economy which apply products from composite materials, and personally in aviation and rocket and space equipment..	
3 – Characteristics of the educational program	
Subject area	**Objects of study** - the emergence and problems used with the stages of creation of composite structures of aerospace and rocket technology. The purpose of training-acquisition of competencies, a sufficient number to combine specialized and practical tasks used for the development and production of production composite structures of aerospace and rocket technology. **Theoretical content of the subject area** - the concepts and principles of physical processes, mechanics of deformed solids, technical mechanics,

	hydraulics, aerodynamic gas dynamics, thermophysics and electrical engineering. **Methods, techniques and technologies**-analytical, numerical and experimental methods of research of tasks of the subject area, integrated computer technologies, techniques and technologies used with the stages of discovery and production of composite structures of aviation and rocket and space technology. **Instruments and equipment** - laboratory equipment with measuring instruments, use of hydraulic stands, wind tunnels, equipment for the study of power materials, stress-strain state of structures; training laboratories for the study of aircraft structures, equipment used for the production, assembly and testing of composite structures of aircraft and rocket and space technology; computers with information and specialized software, computer calculation systems, geometric modeling, finite product analysis, integrated design and manufacture of aircraft and rocket and space technology.
The educational program orientation	The educational-professional program of bachelor's training is designed for students who aspire to become specialists in the field of design and production of composite structures.
The main focus of the educational program and specialization	The educational-professional program establishes qualification requirements for social and production activities of graduates of higher education in the specialty 134 "Aviation and rocket-space technology" educational degree "Bachelor" and state requirements for the properties and qualities of a person who has obtained a certain educational level. educational and professional program "Design and manufacturing of composite structures".
Program features	The educational program is aimed at studying the calculations of composite materials and on their basis structures, the creation of technological processes for the production of composite structures, the development of structural solutions for aviation equipment from composite materials, using information and additive technologies. The practice is carried out at enterprises that manufacture structures from composite materials, including the aviation and missile industries.
4 – Suitability of graduates for employment and further education	
Suitability for employment	Professional activity as a specialist in the design and manufacture of composite structures. 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 prepared to work in the field of "Aviation and rocket and space technology" according to the classification of economic activities according to DK 009-2010: Section C - Manufacturing. Section 30 - Manufacturing of other transport equipment Group 30.3 – Manufacturing of air and spacecraft, related equipment Class 30.30 – Manufacturing of air 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: GCПППТР code - 23485 Mechanic GCПППТР code - 24971 Technician-designer (mechanics) GCПППТР code - 25041 Technician-technologist (mechanics) The specialist is prepared 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 composite structures.
Further education	Continuation of education at the second (master's) level to obtain the degree of "Master".
5 – Teaching and assessment	
Teaching and assessment	Student-centered learning, self-study, problem-oriented learning is 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 on the basis of textbooks and abstracts, consultations with teachers, preparation of bachelor's thesis.
Evaluation	The written exams, reports on practices, essays, presentations, current (modular) control, qualification work of the bachelor and his defense.
6 – Software competencies	
Integral competence (InC)	Ability to solve complex specialized and practical problems associated with the creation of structures of aerospace and rocket technology from composite materials, which involves the use of theories and methods of mechanical engineering, and is characterized by complexity and uncertainty of conditions.
General competencies (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 the ability to work in a team.
	GC 4. Ability to evaluate and ensure the quality of work performed. GC 5. Predicting 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 in the field of business and professional (scientific and technical) communication. GC 8. Practical use of a foreign language in social and professional spheres of communication.

Professional competence of specialty (PFC)	PFC 1. The use of mathematical apparatus in solving problems in the design and manufacture of composite structures. PFC 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, aero-hydrodynamics. PfC 3. Ability to set and solve problems of designing parameters of products and processes of their production. PFC 4. Ability to assess the load on structural elements based on the conditions of their operation. PFC 5. Ability to calculate elements of aerospace and rocket technology, including composite materials using knowledge in the field of mechanics and strength of materials and structures. PFC 6. Design the main structural elements of ACT (spars, cladding, ribs, etc.) including composite materials. PFC 7. Carry out a qualified choice of class of materials for parts and products of aerospace technology on the basis of knowledge of the basics of the structure of metals and non-metals and methods of modification of their properties. PFC 8. Ability to perform experiments to determine the properties of materials, including pure composites, as well as to describe, analyze and critically evaluate experimental data. PFC 9. Ability to use appropriate software (programming languages, packages) for physical and mathematical calculations in the field of design and manufacture of composite structures. PFC 10 Have knowledge in the field of economics and management of the aerospace industry. PFC 11. Ability to develop typical technological processes for the production of elements of aviation and rocket and space technology, including composite materials. PFC 12. Develop technical and design documentation for the manufacture of basic elements of ACT (including composites).
7 – Program learning outcomes	
Program learning outcomes (PLO)	PLO 1. Ability to think mathematically and logically, 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 technology. 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 the technical task, layout diagrams, technical and reference literature, computers in accordance with standard calculation methods. PLO 6. To calculate the stress-strain state, to determine the bearing capacity of structural elements of aviation and rocket and space technology, including composite materials. PLO 7. Calculations of planar mechanisms with rotating and translational kinematic pairs of ACT 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 knots and connections of AST 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 AST components with CM, that the structures

	of CM, rods and rods, beams and spars, shells and panels using mathematical models of basic elements, typical CTE 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 aircraft and rocket and space technology. PLO 12. To show abilities and skills concerning development of technological processes of production and a choice of technological equipment, calculation of need for materials for typical constructive elements of aerospace equipment of details including from composite materials. PLO 13.Describe the sequence of calculating the economic efficiency of production of elements and systems of aviation rocket and space technology. PLO 14.Development of design documentation, sections of explanatory notes of works of sketch projects of average complexity of elements of ACP products including from composite materials and construction of the drawing by existing methods on the basis of regulatory documents and operating standards, including with use of automation of design works.
8 – Resource support for the implementation of the program	
The main characteristics of staffing	Research and teaching staff involved in the teaching of professionally oriented disciplines have academic degrees and / or academic titles and meet licensing requirements.
The main characteristics of material and technical providing	Training is carried out in training laboratories, computer classes of the Department of Composite Structures and Aviation Materials Science of the National Aerospace University. H.E. Zhukovsky "Kharkiv Aviation Institute".
The main characteristics of informational and methodical support	The use of virtual learning environment of the National Aerospace University H.E. Zhukovsky "Kharkiv Aviation Institute" and author's developments of scientific and pedagogical staff.
9 – Academic mobility	
National Credit Mobility	On the basis of bilateral agreements between the National Aerospace University H.E. Zhukovsky "Kharkiv Aviation Institute" and technical universities of Ukraine.
International Credit Mobility	On the basis of bilateral agreements between the National Aerospace University H.E. Zhukovsky "Kharkiv Aviation Institute" and universities of foreign partner countries.
Teaching 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-PROFESSIONAL PROGRAM (EPP) AND THEIR LOGICAL SEQUENCE

3.1 List of EP components

Code	Components of the educational program (subjects, course projects/works, practices, qualification work)	ECTS Credits	Form of final control
1	2	3	4
Indispensable components			
IC1	Foreign Language	7	credit with mark
IC2	History and culture of Ukraine	3	credit
IC3	Humanities discipline of the student's choice	3	credit
IC4	Ukrainian language (for professional purposes)	3	credit
IC5	Philosophy	3	credit
IC6	Engineering materials science	3	exam
IC7	Higher mathematics	17,5	exam
IC8	Electrical engineering	3	credit
IC9	descriptive geometry	4	exam
IC10	Programming and calculation methods	4,5	exam
IC11	Theoretical mechanics	8	exam
IC12	Thermodynamics and heat transfer	3,5	credit
IC13	Physics	10,5	exam
IC14	Chemistry and basics of ecology	3	credit
IC15	Engineering basics of aviation and rocket and space technology	3	credit
IC16	Engineering and computer graphics	6	credit with mark
IC17	Materials science	4	exam
IC18	Interchangeability and standardization	3	credit
IC19	Machine parts and basics of design	5	exam
IC20	Machine parts and basics of design (KP)	2	credit with mark
IC21	Business Economics	4	credit
IC22	Mechanics of materials and structures	9	exam
IC23	Theory of mechanisms and machines	3,5	exam
IC24	Theory of mechanisms and machines (KP)	2	credit with mark
IC25	Technologies of construction materials	6	exam
IC26	Introductory practice	3	credit
IC27	Educational practice	3	credit
IC28	Internship	4	credit
IC29	Bachelor's qualification work	9	protection of qualification work
The total amount of indispensable components:		**142,5**	
Optional components EP			
Optional block 1			
OB1.1	Aerohydrodynamics	4,5	exam
OB1.2	Construction mechanics	8	exam
OB1.3	Hydraulics	3	credit

OB1.4	Experimental studies of structures made of composite materials	5	exam
OB1.5	General principles of engineering design	4,5	exam
OB1.6	Computer aided design technologies	6	credit
1	**2**	**3**	**4**
OB1.7	Design and engineering of composite products	9	іспит
OB1.8	Design and engineering of products from composites (KP)	2	credit with mark
OB1.9	Strength of composite structures	4	exam
OB1.10	Strength of aircraft	8,5	exam
OB1.11	ITU in the calculations of composite structures	8,5	exam
OB1.12	Mechanics of reinforced materials	4	exam
OB1.13	Mechanics of composites structures	8	exam
OB1.14	Non-destructive methods of quality control of composite structures	3	credit
OB1.15	Calculation and design of joints of composite structures	4	exam
OB1.16	Special sections of materials science	3	credit
OB1.17	Technology of production of products from composites	10,5	credit, exam
OB1.18	Technology of production of products from composites (KP)	2	credit with mark
Optional block 2			
OB2.1	Aerodynamics	4,5	exam
OB2.2	Construction mechanics of composite structures	8	exam
OB2.3	Hydrodynamics	3	credit
OB2.4	Calculation of composite structures for strength	6	exam
OB2.5	Methods for determining the quality of composite structures	5,5	exam
OB2.6	Applied programming in engineering	6	credit
OB2.7	Calculation of properties of composite materials	6	exam
OB2.8	Mechanics of composites structures	4	exam
OB2.9	Design of composite structures (KP)	2	credit with mark
OB2.10	Applied methods of engineering calculations	4	exam
OB2.11	Features of designing joints of aircraft structures	5	exam
OB2.12	Physical chemistry of polymer composites	4	exam
OB2.13	Design of composite structures	4	exam
OB2.14	Production of composite structures	9	exam
OB2.15	Mechanics of composites structures	3,5	credit
OB2.16	Applied programming in engineering	6	exam
OB2.17	Computer systems for calculating composite structures	6	credit
OB2.18	Strength of products from composite materials	4	exam
OB2.19	Methods of non-destructive quality control of composites	5	exam
OB2.20	Production of composite structures (KP)	2	credit with mark
The total amount of optionale components:		**97,5**	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		**240**	

3.2 Structural-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 the mandatory

components and components of the sample units. The applicant of higher education chooses a sample of the above two and determines the individual trajectory of study.

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

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
1 semester					
1	IC1	Foreign Language	**Purpose:** to provide knowledge of phonology, phonetics, morphology, syntax and stylistics, basic vocabulary of household and professional topics and the main broadcaster for communication. **Objectives:** 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	IC2	History and culture of Ukraine	**Purpose:** to provide knowledge about the essence of socio-political and state-building processes that took place in the minimum of Ukraine, their objective conditionality, relationships and interdependence; development of national self-consciousness, education of students' patriotic, moral and ethical beliefs, supplementing their navigation of scientific analysis, prevention of independent comprehension of patterns of historical development, training in practical skills of working with historical sources and scientific literature, developing skills to pay attention to Ukrainian history in everyday life activities, to focus on socio-political life, assessment of social phenomena and events. **Objectives:** to develop an understanding of historical processes that took place at a time when they did not take place in Ukraine, their objective nature, relationship and interdependence; content development to analyze and evaluate the emergence 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 a particular system; formation of the consciousness of a citizen and a patriot; the content is focused on the scientific periodization of history, the comparison of historical processes with epochs and the application of knowledge acquisition to predict social processes in Ukraine.	GC2	
3	IC7	Higher mathematics	**Purpose:** to master the methods that allow analytical research of mathematical models (correctness, completeness, complexity, stability of solutions, etc.). **Objectives:** the 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	PFC1
4	IC9	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.	GC1	PFC1

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
			Objectives: development of spatial representation and imagination, constructive-geometric thinking, abilities to analyze and synthesize spatial forms and relationships, study ways 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.		
5	IC13	Physics	**Purpose:** 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. **Objective:** to study the basic patterns, methods and models for further use in the disciplines of the specialty.	GC1 GC2	PFC1 PFC2
6	IC14	Chemistry and basics of ecology	**Purpose:** to provide students with a general idea of the composition of environmental objects, mastering the theory and practice of methods of chemical and physico-chemical analysis. **Objectives:** Acquisition by students of knowledge about the peculiarities of the 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 object of the environment; features of chemical control of natural objects; determination of mechanisms of chemical reactions.	GC1 GC5	PFC2
7	IC15	Engineering basics of aviation and rocket and space technology	**Purpose:** to provide students with information about existing aerospace technology (ACT), their components and principles of movement. To acquaint students with composite materials (CM), which are widely used in the production of ACT objects. **Objectives:** to study the existing types of ACP objects, their features, structure, principle of operation. Obtaining primary knowledge about CM, their classification, properties and application in the objects of the national economy.	GC1	PFC4
II semester					
8	IC7	Higher mathematics	**Purpose:** to master the methods that allow analytical research of mathematical models (correctness, completeness, complexity, stability of solutions, etc.). **Objectives:** the 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	PFC1
9	IC1	Foreign Language	**Purpose:** to provide knowledge of phonology, phonetics, morphology, syntax and stylistics, basic vocabulary of household and professional topics and the main broadcaster for communication. **Objectives:** 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	

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
10	IC4	Ukrainian language (for professional purposes)	**Purpose:** to get acquainted with the semantic and structural features of the scientific style of modern Ukrainian literary language in its functional aspect. **Objectives:** acquaintance with the basic concepts of 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.	GC7	
11	IC10	Programming and calculation methods	**Purpose:** acquisition by students of knowledge about the main characteristics of the personal computer, functions and structure of the operating system WINDOWS, 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 aim of the training is also to provide students with knowledge of computational mathematics and the basics of mathematical modeling, to develop skills in adapting standard algorithms to numerical schemes for solving complex applications, effective use of special applications - MathCAD, MATLAB to solve various engineering problems. **Objectives:** to study methods of writing programs, basic algorithms, data structures. Master the full cycle of program development, which includes building a model, developing an algorithm, writing program code, documenting and testing the program. To study the basic algorithms of modern theory of computational methods - solving equations, systems of algebraic equations, numerical methods of integration, approximation of functions, solving ordinary differential equations, systems of ordinary differential equations. Master the ways of using modern specialized application packages.	GC1 GC2	PFC1 PFC9
12	IC11	Theoretical mechanics	**Purpose:** to master the laws of classical mechanics and methods of analytical study of mechanical motion of a material point, solid body and mechanical system **Objective:** to study the basic concepts and laws of statics, kinematics and dynamics for use in calculations of motion and equilibrium of mechanical systems.	GC1 GC2	PFC1 PFC2 PFC5
13	IC13	Physics	**Purpose:** 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. **Objective:** to study the basic patterns, methods and models for further use in the disciplines of the specialty.	GC1 GC2	PFC1 PFC2
14	IC16	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. **Objectives:** to study methods of constructing various geometric spatial objects (mainly surfaces), methods of	GC1	PFC12

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
			obtaining their drawings at the level of graphic models and the ability to solve problems related to spatial objects and their dependencies on these drawings.		
15	IC27	Educational practice	**Purpose:** to gradually develop students' skills in creating three-dimensional models on a computer **Objective:** Introduction to algorithms for constructing machine-building parts and assembly drawings in three-dimensional image on a PC. 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 devices.	GC1 GC3 GC6 GC7	PFC12
III semester					
16	IC6	Engineering materials science	**Purpose:** To study the 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 process of production of parts or structural elements by influencing the composition, structure, shape and location of structural elements and other possible factors. **Objective:** Acquisition of some skills in the selection of construction 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	PFC3 PFC7 PFC8
17	IC7	Higher mathematics	**Purpose:** to master the methods that allow analytical research of mathematical models (correctness, completeness, complexity, stability of solutions, etc.). **Objectives:** the 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	PFC1
18	IC8	Electrical engineering	**Purpose:** formation of students' knowledge of electrical 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 switching on and operating electrical appliances and machines. **Objectives:** formation of students' set of knowledge, skills and ideas on the basic principles of construction and application of electric machines of direct current and elements of technical electronics, their application in practical activities in the specialty.	GC1	PFC1 PFC2
19	IC11	Theoretical mechanics	**Purpose:** to master the laws of classical mechanics and methods of analytical study of mechanical motion of a material point, solid body and mechanical system **Objective:** to study the basic concepts and laws of statics, kinematics and dynamics for use in calculations of motion and equilibrium of mechanical systems.	GC1 GC2	PFC1 PFC2 PFC5
20	IC16	Engineering and	**Purpose:** mastering the basic principles of geometric	GC1	PFC12

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
		computer graphics	modeling, methods of depicting spatial forms on the plane, standards of design documentation, mathematical and algorithmic foundations of computer graphics**.** **Objectives:** to study methods of constructing various geometric spatial objects (mainly surfaces), methods of obtaining their drawings at the level of graphic models and the ability to solve problems related to spatial objects and their dependencies on these drawings.		
21	IC18	Interchangeability and standardization	**Purpose:** Mastering the basics of interchangeability, standardization and metrology, gaining skills in the use and compliance with the requirements of standards, performing calculations of the choice of plantings of typical conjugations. **Objective:** to obtain the knowledge necessary in the process of further study at the university, and in the subsequent practical engineering activities.	GC1	PFC12
22	IC22	Mechanics of materials and structures	**Purpose:** to give knowledge about modern engineering methods of calculations of elements of constructions and constructions on durability, rigidity and stability. **Objective:** to 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 in static and cyclic and dynamic load.	GC1 GC2	PFC2 PFC5 PFC8
IV semester					
23	IC22	Mechanics of materials and structures	**Purpose:** to give knowledge about modern engineering methods of calculations of elements of constructions and constructions on durability, rigidity and stability. **Objective:** to 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 in static and cyclic and dynamic load.	GC1 GC2	PFC2 PFC5 PFC8
24	IC23	Theory of mechanisms and machines	**Purpose:** formation of a system of knowledge on the theory and methodology of analysis and synthesis of typical mechanisms of aviation and space technology. **Objective:** 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	PFC2 PFC5
25	IC24	Theory of mechanisms and machines (KP)	**Purpose:** 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. **Objective:** 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	PFC2 PFC5

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
26	IC25	Technologies of construction materials	**Purpose:** knowledge of the materiality, areas of use, physico-chemical, technological features of the processes of manufacturing blanks (parts) by metal cutting, foundry, electroplating, hardening of surfaces by deformation and other methods. **Objective:** to teach the skilled application of knowledge in practice in the development of modern methods of production of workpieces, parts, assemblies, units/	GC1 GC5	PFC3 PFC11
27	IC12	Thermodynamics and heat transfer	**Purpose:** to acquire knowledge, skills and abilities that will allow to developed simplified semantic and mathematical models of thermodynamics and heat transfer processes in aerospace objects. **Objectives:** practical implementation of thermodynamic analysis and optimization of energy conversion processes, determining the maximum possible efficiency of power plants and the main sources of efficiency, calculating the temperature of the simplest geometric analogues of aerospace objects.	GC1 GC2	PFC1 PFC2
28	IC26	Introductory practice	**Purpose:** 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 **Objectives:** to learn to use the mathematical package Mathematica to perform calculation and graphic work in the process of further training.	GC1 GC3 GC6 GC7	PFC9
29	OB1.1	Aero-hydrodynamics	**Purpose:** 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. **Objectives:** 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	PFC1 PFC2 PFC4
30	OB1.6	Computer aided design technologies	**Purpose:** Acquisition by students of skills of designing and technological preparation of production of elements of aviation designs of composite materials with use of three-dimensional systems of the automated designing. **Objective:** to study the theoretical foundations of automated design of aerospace products and the acquisition of practical skills in modeling aviation composite structures in CAD / CAM / CAE systems.	GC1 GC2	PFC1 PFC2 PFC5 PFC6

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
31	IC17	Materials Science	**Purpose:** To study the 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 process of production of parts or structural elements by influencing the composition, structure, shape and location of structural elements and other possible factors. **Objective:** Acquisition of some skills in the selection of construction 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	PFC3 PFC7 PFC8
V semester					
32	IC5	Philosophy	**Purpose:** to provide 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. **Objectives:** to form in students 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 one's own life, interpersonal relations, 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	
33	IC19	Machine parts and basics of design	**Purpose:** students acquire the knowledge and skills needed in the calculation and design of parts and components of aviation and space technology. **Objectives:** study of bases of calculations and designing, criteria of serviceability of details and knots of cars, mastering of methods of calculation of various details, acquaintance with modern methods of designing.	GC1	PFC5
34	IC25	Technologies of construction materials	**Purpose:** to study methods that allow to analyze and develop technological processes of obtaining high quality products. **Objectives:** study of methods for determining the elastic-plastic and thermal state of workpieces or parts, optimization of process parameters, equipment selection, development of equipment and facilities, etc**.**	GC1 GC5	PFC3
35	OB1.3	Hydraulics	**Purpose:** formation of a system of knowledge on the basics of fluid dynamics and performance of hydraulic calculations. **Objectives:** to gain knowledge of the basics of fluid dynamics and skills in solving specific engineering problems in the design of hydraulic and pneumatic devices and systems.	GC1 GC2	PFC1 PFC2 PFC4
36	OB1.2	Construction mechanics	**Purpose:** to obtain knowledge about the requirements for the structures of complex multi-element load-bearing structures in	GC1 GC2	PFC1 PFC2

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
			general - and, in particular, thin-walled - and the features of their deformation in real operation; about the limit states of such structures. **Objective:** to teach methods for determining stresses, displacements in the elements of composite structures from the action of known (given) external forces, natural frequencies and oscillations of simple elements of such structures, as well as methods for determining the limit values of external action parameters leading to limit states of structures or elements .		PFC5 PFC6
37	OB1.12	Mechanics of reinforced materials	**Purpose:** to give the necessary knowledge for analytical research of reinforced materials (forecasting of elastic properties, determination of stress - strain state, etc.). **Objective:** to study the basics of micro- and macromechanics of reinforced materials needed to determine the physical and mechanical characteristics (MCh) of composite materials (CM).	GC1 GC2	PFC1 PFC2 PFC5
38	OB1.17	Technology of production of products from composites	**Purpose:** to provide students with information about the processes of manufacturing products from polymer composites, which is necessary for the design of composite elements. To form students' knowledge of the main processes, methods, equipment and facilities for the manufacture of composite products; ability to take into account technological capabilities and limitations in design. **Objective:** to study the main stages and features of technological preparation for the production of products from KM, classification and general characteristics of technological processes for the production of parts from KM; technological processes and equipment for molding, forming, machining of parts with KM.	GC1 GC2 GC5	PFC1 PFC3 PFC7 PFC11 PFC12
VI semester					
39	IC3	Humanities at the student's choice (Political Science, Law, Psychology, Sociology, Ethics, Organizational Culture and the Image of a Modern Leader)	**Purpose:** students' mastery of political world and domestic processes, patterns of development and functioning of political science, its place and role in society. **Objectives:** to study the essence, history, theory and methodology of political activity and behavior, to be able to navigate the main world political schools, concepts and directions, to know and be able to characterize Ukrainian political teachings, to have an idea of the essence of political life, political relations and processes. and subject of politics.	GC2	
40	IC20	Machine parts and basics of design (KP)	**Purpose:** students gain knowledge and skills, consolidation of knowledge gained during the study of the course "Parts of machines and basics of design", gaining experience and practical skills in solving problems related to the design of parts and components of aerospace technology **Objectives:** calculation and design of one of the components of aircraft engines, helicopters, design of wires of technological equipment used in their manufacture**.**	GC1 GC3 GC4 GC7	PFC5
41	IC28	Internship	**Purpose:** 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 m material for the course project. **Objectives:** to study the structure of the shop (enterprise), the system of organization of the production process and	GC1 GC3 GC5 GC7	PFC12

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
			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. Gain skills in working with composite materials.		
42	OB1.2	Construction mechanics	**Purpose:** to obtain knowledge about the requirements for the structures of complex multi-element load-bearing structures in general - and, in particular, thin-walled - and the features of their deformation in real operation; about the limit states of such structures. **Objective:** to teach methods for determining stresses, displacements in the elements of composite structures from the action of known (given) external forces, natural frequencies and oscillations of simple elements of such structures, as well as methods for determining the limit values of external action parameters leading to limit states of structures or elements .	GC1 GC2	PFC1 PFC2 PFC5 PFC6
43	OB1.7	Design and engineering of composite products	**Purpose:** to study the methods and algorithms for designing the basic elements of aircraft structures from composite materials. **Objective:** study of analytical and numerical methods of designing rods, shells, beams, panels and connections of power elements from composite materials, as well as study of design and technological solutions used in the manufacture of aircraft structures from composite materials.	GC1 GC2	PFC1 PFC5 PFC6
44	OB1.10	Strength of aircraft	**Purpose:** to train 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. **Objectives:** 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 power circuits at operating and design loads, strength and durability criteria.	GC1 GC2	PFC1 PFC2 PFC4
45	OB1.13	Mechanics of composites structures	**Purpose:** to give the necessary knowledge on the application of physical and mathematical models to determine the stress - strain state (SSS) of structures and their elements of composite materials (CM); acquaintance of students with modern methods of normalization of loadings and calculation on durability that will allow to carry out analysis and synthesis more effectively at designing of composite designs of aircrafts (AC). **Objective**: to study the methods of calculating the SSS of structures made of composites on the basis of classical models of the rod, beam, plate and shell.	GC1 GC2	PFC1 PFC2 PFC5 PFC6 PFC9
46	OB1.17	Technology of production of products from composites	**Purpose:** to provide students with information about the processes of manufacturing products from polymer composites, which is necessary for the design of composite elements. To form students' knowledge of the main processes, methods, equipment and facilities for the manufacture of composite products; ability to take into account technological capabilities and limitations in design. **Objective:** to study the main stages and features of technological preparation for the production of products	GC1 GC2	PFC1 PFC3 PFC7 PFC11 PFC12

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
			from CM, classification and general characteristics of technological processes for the production of parts from CM; technological processes and equipment for molding, forming, machining of parts with CM.		
VII semester					
47	IC21	Business Economics	**The purpose of the study:** to provide the necessary knowledge about the economic activity of the enterprise in order to organize the production (provision of services) with maximum economic efficiency. **Objectives:** the formation of modern management 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	PFC10
48	OB1.7	Design and engineering of composite products	**Purpose:** to study the methods and algorithms for designing the basic elements of aircraft structures from composite materials. **Objectives:** to study analytical and numerical methods of designing rods, shells, beams, panels and joints of power elements from composite materials, as well as to study structural and technological solutions used in the production of typical structural elements of aircraft from composite materials.	GC1 GC2	PFC1 PFC5 PFC6
49	OB1.9	Strength of composite structures	**Purpose:** to give the necessary knowledge in the application of physical and mathematical models in special problems of mechanics of composite materials and composite structures; acquaintance of students with models of definition of limiting bearing capacity of composite designs, and also with bases of linear mechanics of destruction. **Objectives:** to study methods for calculating physical and mechanical properties for composites with asymmetric structure of the package in thickness, existing models of degradation of KM properties to study the gradual destruction of composite structures, basics of designing structures for long-term strength and methods of experimental study of fracture.	GC1 GC2	PFC1 PFC2 PFC4 PFC5 PFC6
50	OB1.10	Strength of aircraft	**Purpose:** training of specialists to solve engineering problems to ensure the strength and life of the power structure of the aircraft, arising at the stages of design, manufacture and operation of aircraft. **Objectives:** students study the requirements of the Airworthiness Standards AP.23, CS-VLA, methods of calculating loads, the strength of units of aircraft structures in flight in turbulent air and when maneuvering, features of calculations of durability of passenger, transport and shunting aircraft.	GC1 GC2	PFC1 PFC2 PFC4
51	OB1.11	ITU in the calculations of composite structures	**Purpose:** to study modern numerical methods for calculating the strength of composites, in particular the finite element method. **Objective:** to study modern numerical methods for calculating the strength and stability of composites and the acquisition of skills in modeling elements of aircraft structures using an engineering analysis system.	GC1 GC2	PFC1 PFC5 PFC6
52	OB1.13	Mechanics of composites	**Purpose:** to give the necessary knowledge on the application of physical and mathematical models to determine the stress - strain state (SSS) of structures and their elements of composite	GC1 GC2	PFC1 PFC2 PFC5

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
		structures	materials (CM); acquaintance of students with modern methods of normalization of loadings and calculation on durability that will allow to carry out analysis and synthesis more effectively at designing of composite designs of aircrafts (AC). **Objective:** to study the methods of calculating the SSS of structures made of composites on the basis of classical models of the rod, beam, plate and shell.		PFC6 PFC9
53	OB1.14	Non-destructive methods of quality control of composite structures	**Purpose:** to form in students a set of knowledge about the set of characteristics that provide the required level of quality of products made of composite materials (CM). Familiarization of students with modern methods of defectoscopy of aerospace structures made of CM. Study of the main types of defects that occur in structures with CM during production and operation of products, and methods of preventing defects. **Objective:** To determine the main characteristics that provide the required level of quality of CM products. Gain some experience in choosing the methods of defectoscopy of aerospace structures with CM.	GC1 GC2 GC4	PFC1 PFC3
54	OB1.18	Technology of production of products from composites (KP)	**Purpose:** consolidation of knowledge gained during the study of the course "Technology of production of products from composites", gaining experience and practical skills in solving problems related to the manufacture of products from polymer composites, **Objective:** development of the technological process of production of parts from KM, calculation of parameters of the technological process, selection of equipment for forming, forming, and machining of parts from KM.	GC1 GC2 GC3 GC5 GC7	PFC1 PFC3 PFC7 PFC11 PFC12
VIII semester					
55	OB1.4	Experimental studies of structures made of composite materials	**Purpose:** mastering experimental research methods FMH KM, their dependence on technological factors and changes in environmental conditions. **Objectives:** mastering the methods of experimental determination of FCM materials, as well as the characteristics of structures (strength, rigidity, stability, endurance). Study of equipment and equipment for experiments.	GC1 GC2 GC4	PFC1 PFC8
56	OB1.5	General principles of engineering design	**Purpose:** to study the peculiarities of the formation of echnical problems, both at the stage of formation of the oncept of the aircraft (AC), and at the stage of structural and echnological processing of structural elements (sketch and echnical design). **Objective:** to conduct a functional analysis of structural lements, including the design of composite structures using nethods of solving technical problems, methods of directed earch for solutions and methods of formulating expressions f state (behavior) of the object according to accepted nodels	GC1 GC2	PFC1 PFC6
57	OB1.8	Design and engineering of products from composites (KP)	**Purpose:** consolidation of knowledge gained during the study of the course "Design and engineering of composite products", gaining experience and practical skills in solving problems related to the design of basic structural elements of aircraft from composite materials. **Objective:** design and construction of a spar with a strut made of composite materials.	GC1 GC2 GC3 GC4 GC7	PFC1 PFC2 PFC4 PFC5 PFC6 PFC12

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
58	OB1.11	ITU in the calculations of composite structures	**Purpose:** to study modern numerical methods for calculating the strength of composites, in particular the finite element method **Objective:** to study modern numerical methods for calculating the strength and stability of composites and the acquisition of skills in modeling elements of aircraft structures using an engineering analysis system.	GC1 GC2	PFC1 PFC5 PFC6
59	OB1.15	Calculation and design of joints of composite structures	**Purpose:** to study the features of the composite in the transition zones of different nature, and to present them as specific compounds, which will take into account the local nature of the material load. **Objective:** to calculate the adhesive and (or) multi-row mechanical connection with constant parameters; take into account the influence of the moment in the joint plane on the load of the adhesive and mechanical connection; assess the pliability and load-bearing capacity of the combined power connection of any structure.	GC1 GC2	PFC1 PFC2 PFC4 PFC5 PFC6
60	OB1.16	Special sections of material science	**Purpose:** to study the patterns of formation of physical-mechanical and technological properties of materials, decision-making methodology for the choice of materials and methods of their processing on the basis of information databases. **Objective:** to determine the main functional properties of materials, basic methods and dependencies that allow to give the material the required performance properties, by influencing its structure and composition. Gain some experience in the selection of ACP materials based on the analysis of their performance properties, methods of improving the properties, cost and availability of materials. Gain the skills to form requirements for the details of ACP structures and work with directories and technical documentation on the choice of materials.	GC1 GC2	PFC1 PFC2 PFC7
61	IC29	Bachelor's qualification work	**Purpose:** to determine 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. **Objective:** - systematization, consolidation and expansion of theoretical knowledge obtained in the process of training in the educational-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 level of training of graduates to the requirements of educational characteristics of the specialist,	GC1 GC2 GC3 GC4 GC5 GC7 GC8	PFC1 PFC2 PFC3 PFC4 PFC5 PFC6 PFC7 PFC8 PFC9 PFC10 PFC11 PFC12

№	Code CEP	Name of the EP component	The purpose and objectives of the EP component	Formation of competencies	
				general	profes-sional
			his readiness and ability to work independently in a market economy, modern production, progress of science, technology and culture.		

4 FORM OF GRADUATION CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Graduation certification of applicants for higher education under the educational program "Design and manufacturing of composite structures" 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 aerospace and rocket-space technology, specialization 134 "Aviation and rocket-space technology".

Graduation certification is open and public.

5 MATRIX OF ACCORDANCE OF PROGRAM COMPETENCES TO COMPONENTS OF THE EDUCATIONAL-PROFESSIONAL PROGRAM

Programme competencies	Components of the educational program																																														
	IC 1	IC 2	IC 3	IC 4	IC 5	IC 6	IC 7	IC 8	IC 9	IC 10	IC 11	IC 12	IC 13	IC 14	IC 15	IC 16	IC 17	IC 18	IC 19	IC 20	IC 21	IC 22	IC 23	IC 24	IC 25	IC 26	IC 27	IC 28	IC 29	OB1.1	OB1.2	OB1.3	OB1.4	OB1.5	OB1.6	OB1.7	OB1.8	OB1.9	OB1.10	OB1.11	OB1.12	OB1.13	OB1.14	OB1.15	OB1.16	OB1.17	OB1.18
GC 1						+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
GC 2		+	+		+	+	+			+	+	+	+									+	+	+					+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
GC 3																				+				+		+	+	+	+								+										+
GC 4																				+				+					+				+				+						+				
GC 5														+											+			+	+																	+	+
GC 6																										+	+								+												
GC 7				+																+				+		+	+	+	+								+										+
GC 8	+																												+																		
PFC 1							+	+	+	+	+	+	+																+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PFC 2								+			+	+	+	+								+	+	+					+	+	+	+						+	+		+	+		+	+		
PFC 3						+											+								+				+														+			+	+
PFC 4															+														+	+		+						+	+					+			
PFC 5											+								+	+		+	+	+					+		+					+	+	+		+	+	+		+			
PFC 6																													+		+			+		+	+	+		+		+		+			
PFC7						+											+												+																+	+	+
PFC8						+											+					+							+				+														
PFC9										+																+			+						+							+					
PFC 10			+																		+								+																		
PFC 11																									+				+																	+	+
PFC 12																+		+										+	+						+	+	+									+	+

6 MATRIX OF PROCURING PROGRAM OUTCOMES OF LEARNING

TO RELEVANT COMPONENTS OF EDUCATIONAL-PROFESSIONA PROGRAM

Program learning outcomes	Components of the educational program																																												
	IC 1	IC 2	IC 3	IC 4	IC 5	IC 6	IC 7	IC 8	IC 9	IC 10	IC 11	IC 12	IC 13	IC 14	IC 15	IC 16	IC 17	IC 18	IC 19	IC 20	IC 21	IC 22	IC 23	IC 24	IC 25	IC 26	IC 27	IC 28	IC 29	OB1.1	OB1.2	OB1.3	OB1.4	OB1.5	OB1.6	OB1.7	OB1.8	OB1.9	OB1.10	OB1.11	OB1.12	OB1.13	OB1.14	OB1.15	OB1.16	OB1.17	OB1.18
PLO 1							+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PLO2		+	+		+																																									
PLO 3						+											+								+																				+	+
PLO 4										+																+									+											
PLO5																														+									+								
PLO 6																			+	+		+									+					+	+	+			+	+	+		+			
PLO 7											+													+	+						+																
PLO 8																				+	+																							+			
PLO 9						+											+																+														
PLO 10																													+							+	+							+			
PLO 11																+		+							+				+																+		
PLO 12																													+																	+	+
PLO 13																					+																									+	+

Appendix A

STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL-PROFESSIONAL PROGRAM