ID 17923

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

National Aerospace University
"Kharkiv Aviation Institute"

APPROVED
the Academic Council
of the National Aerospace University
"Kharkiv Aviation Institute"
April 19, 2017, Minutes № 13
Order № 178 of April 19, 2017

EDUCATIONAL PROFESSIONAL PROGRAM

Systems of Autonomous Navigation and Adaptive Control of Aircrafts

Level of higher education - first (bachelor's)

in specialty 173 Avionics

in the field of study 17 Electronics and Telecommunications

Qualification: Bachelor's degree in Avionics in area of knowledge Electronics and Telecommunications

(as amended in accordance with the decisions:
Academic Council of KhAI, minutes № 9 of April 25, 2018,
Scientific and Methodological Commission (NMC) № 2, minutes № 1of August 31, 2020,
Academic Council of KhAI, minutes № 9 of April 28, 2021)

The educational program is put into operation
form September 01, 2021

Rector of National Aerospace
University “Kharkiv Aviation Institute”

_____ M. V. Nechiporuk
order № 178 of April 29, 2021

Kharkiv 2021

PREFACE

Educational and professional program "Systems of Autonomous Navigation and Adaptive Control of Aircraft" for the preparation of applicants for the first (bachelor's) level of higher education in the specialty 173 "Avionics" at the National Aerospace University "Kharkiv Aviation Institute" (hereinafter - KhAI) was updated in connection with:

– with the redistribution of ECTS credits between the components of the educational and professional program and updating the content of its description (approved by the decision of the Academic Council, Minutes № 9 of April 25, 2018);

– with changes in accordance with the MES Standard (MES Order № 385 of March 04, 2020) and changes in the National Qualifications Framework (Resolution of the Cabinet of Ministers of Ukraine of June 25, 2020, № 519) (approved by the decision of the scientific-methodical commission 2 (NMC 2), minutes № 1 of August 31, 2020);

– with the redistribution of ECTS credits between the components of the educational and professional program and updating the content of its description (approved by the decision of the Academic Council, Minutes № 9 of April 28, 2021).

Update of the educational and professional program "Systems of Autonomous Navigation and Adaptive Control of Aircraft" was carried out by the group of development and support of EPP KhAI consisting of:

1	Head (guarantor) of the educational program	Kulik A. S.	- Dr. Tech. Sciences, Professor, Department of Aircraft Control Systems
2	Group members:	Dergachov K. Yu.	- PhD in Tech. Sciences, Associate Professor, Senior Researcher, Head of the Department of Aircraft Control Systems
3		Zimovin A. Ya.	- PhD in Tech. Sciences, Professor, Department of Aircraft Control Systems

Members of the working group:

1	Dergachov V. A.	- PhD in Tech. Sciences, Associate Professor, Department of Aviation Instruments and Measurements
2	Dzhulgakov V. G.	- Associate Professor, Department of Aircraft Control Systems

Reviews of external stakeholders (if available):

1

2

INTRODUCTION

According to Art. 1 "Basic terms and their definitions" of the Law of Ukraine "On Higher Education" of July 01, 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 training 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 activities by specialty and specialization;

– development of curriculum, programs of disciplines and practices;

– development of diagnostic tools for the quality of higher education;

– determining the content of training in the system of retraining and advanced training;

– professional orientation of applicants.

Educational and professional program takes into account the requirements of the Law of Ukraine "On Higher Education" of July 01, 2014 № 1556-VII (with changes), Resolution of the Cabinet of Ministers of Ukraine "On approval of the National Qualifications Framework" of November 23, 2011 № 1341 (with changes), standard of higher education in specialty 173 "Avionics» for the first (bachelor's) level of higher education (order of the Ministry of Education and Science № 385 of March 04, 2020) and sets:

– the amount and duration of bachelor's degree;

– general competencies;

– professional competencies;

– program learning outcomes;

– the list and scope of academic disciplines for mastering the competencies of the educational-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 training;

– certification of bachelors in the educational and professional program "Systems of Autonomous Navigation and Adaptive Control of Aircraft" in the specialty 173 "Avionics".

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 " Systems of Autonomous Navigation and Adaptive Control of Aircraft" in the specialty 173 "Avionics";

– examination commission of specialty 173 "Avionics";

– 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 specialists with a bachelor's degree in the educational and professional program " Systems of Autonomous Navigation and Adaptive Control of Aircraft" in specialty 173 "Avionics".

1 REGULATORY REFERENCES

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

1.1 Law of Ukraine "On Higher Education". № 1556-UII of July 01, 2014 (as amended).

1.2 Resolution of the Cabinet of Ministers of Ukraine "On approval of the National Qualifications Framework" of November 23, 2011 № 1341 (as amended).

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" of April 29, 2015 № 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" of August 12, 2015 № 579.

1.5 National Classifier of Ukraine. Classifier of professions DK 003: 2010, approved by the order of Derzhspozhyvstandart of Ukraine of July 28, 2010 № 327 (as amended).

1.6 Methodical recommendations for the development of higher education standards approved by the higher education sector of the Scientific and Methodological Council of the Ministry of Education and Science of Ukraine Minutes № 3 of June 21, 2019 (Approved by the order of the Ministry of Education and Science of Ukraine of October 01, 2019 № 1254).

1.7 Regulations "On the organization of the educational process" of the National Aerospace University "Kharkiv Aviation Institute", approved by the Academic Council of the University.

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 National Qualifications Framework. Appendix to the Resolution of the Cabinet of Ministers of Ukraine of November 23, 2011 № 1324.

1.11 Development of educational programs. Methodical recommendations / Authors: V.M. Zakharchenko, V.I. Lugovyi, Yu.M. Rashkevich, Zh.V. Talanova / Ed. V.G. Flint. - Kyiv: State Enterprise "Priorities", 2014. - 120 p.

1.12 Order of the Ministry of Education and Science of Ukraine "On the peculiarities of the introduction of the list of branches of knowledge and specialties for which higher education students are trained, approved by the Cabinet of Ministers of Ukraine from April 29, 2015 № 266", from November 06, 2015 № 1151.

1.13 Classification of economic activities: DK 009: 2010. - Valid from January 01, 2012. – (National Classification of Ukraine).

1.14 Classifier of professions: DK 003: 2010. - Valid from November 01, 2010. – (National Classification of Ukraine).

1.15 National Educational Glossary: Higher Education / 2nd ed., Revised. and ext. / Authors: V.M/ Zakharchenko, S.A. Kalashnikov, V.I. Lugovyi, A.V. Stavytsky, Yu.M. Rashkevich, Zh.V. Talanova / Ed. V.G. Flint. - Kyiv: Pleiades Publishing House LLC, 2014. - 100 p.

1.16 Standard of higher education in Ukraine: first (bachelor's) level, field of knowledge 17 "Electronics and Telecommunications", specialty 173 "Avionics". - 14 p. - Approved by the order of the Ministry of Education and Science of Ukraine № 385 of March 04, 2020.

2 PROFILE OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM "AUTONOMOUS NAVIGATION SYSTEMS AND ADAPTIVE CONTROL OF AIRCRAFT" IN THE SPECIALTY 17

1 - General information	
Full name of the higher educational institution and structural subdivision	National Aerospace University "Kharkiv Aviation Institute" Department of Aircraft Control Systems
Degree of higher education and title of qualification in the original language	Degree of higher education - bachelor Qualification: Bachelor in Avionics in Areas of knowledge Electronics and Telecommunications
The official name of the educational professional program	Systems of Autonomous Navigation and Adaptive Control of Aircraft
Type of diploma and scope of educational and professional program	Bachelor's degree, single, term of study 3 years 10 months: - on the basis of complete general secondary education - 240 ECTS credits; - on the basis of the degree of junior bachelor (educational qualification level "Junior Specialist"), professional junior bachelor - 240 ECTS credits. KHAI recognizes and recalculates: • no more than 120 ECTS credits obtained in the field of knowledge 17 Electronics and Telecommunications; • not more than 60 ECTS credits obtained in other specialties: • not more than 60 ECTS credits received under the previous professional higher education program.
Availability of accreditation	Certificate of accreditation: UD series № 21008334, issued on January 25, 2019 on the basis of the order of the Ministry of Education and Science of Ukraine dated 19.12.2016 № 1565 Accreditation period: until July 1, 2024
Cycle / level	The first (bachelor's) educational and professional level NRC of Ukraine - level 6. FQ-EHEA - first cycle, EQF-LLL - 6 level
Prerequisites	A person has the right to obtain a bachelor's degree provided he / she has completed general secondary education. Admission based on the degrees of "Junior Bachelor", "specialties Junior Bachelor" or educational qualification level "Junior Specialist " is carried out in the manner prescribed by law
Language (s) of education	The language of instruction is the state language. In order to create the conditions for international academic mobility, it may be decided to teach one or more subjects in English and / or other foreign languages.
Validity of the educational and professional program	Until the introduction of a new educational program
Internet address of the permanent placement of the description of the EPP	**https://khai.edu/ua/education/osvitni-programi-i-komponenti/osvitni-programi-bakalavriv/sistemi-avtonomnoi-navigacii1/**
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-professional program "Systems of Autonomous Navigation and Adaptive Control of Aircraft", specialty 173 "Avionics". 2. Formation of the personality of a specialist able to use professional knowledge and practical skills to solve problems in the field of navigation systems, automated and automatic control systems for autonomous mobile objects, aerospace and rocket objects.	
3 - Characteristics of the educational and professional program	
Description of Subject area	**Objects of study and activity:** automated and automatic control systems for aviation and rocket and space objects and systems, their information support.

	Learning objectives: training of specialists who are able to solve complex specialized problems and practical problems of use and implementation of avionics systems and devices, characterized by complexity and uncertainty of conditions. **Theoretical content of the subject area**: concepts, concepts, principles in the field of flight dynamics, aircraft control systems, electronic and microprocessor technology of avionics and navigation systems. **Methods, techniques and technologies** methods, techniques, technologies of design, research and testing of avionics systems. **Tools and equipment:** stands and simulation software for modeling avionics systems; devices and automatic control systems, computers, microprocessor control systems for onboard and ground equipment.
Orientation of EP	Educational and professional
The main focus of the educational and professional program (specialization)	The educational-professional program establishes qualification requirements for social and production activities of graduates of higher education institutions in the specialty 173 "Avionics" with a bachelor's degree and state requirements for the properties and qualities of a person who has acquired a certain level of education in the educational-professional program "Systems of Autonomous Navigation and Adaptive Control of Aircraft».
Features of the program	The program provides the acquisition of relevant knowledge and competencies in the field of avionics, taking into account the latest advances in technical sciences, in-depth knowledge of modern models, methods and algorithms, as well as technologies for managing aircraft. The exclusivity of the program is associated with the creation of autonomous navigation systems and adaptive control of aircraft. These facilities are critical facilities that have a dual purpose and have high quality requirements. The educational process is based on the widespread use of laboratory stands, which implement the operation of basic navigation and aerobatics subsystems of aircraft. Applicants receive skills in research and development and research under the guidance of leading teachers of avionics. Familiarization and production practices are conducted at enterprises of various industries.
4 - Suitability of graduates for employment and further study	
Suitability for employment	Bachelors in 173 "Avionics" can hold positions in accordance with the National Classification of Occupations of Ukraine: Classifier of Professions (DK 003: 2010) and International Standard Classification of Occupations 2008 (ISCO-08)).
Further training	A person has the right to continue his / her education in a professional or educational-scientific master's degree program, as well as to acquire additional qualifications in the adult education system.
5- Teaching and assessment	
Teaching and learning	Lectures, multimedia lectures, laboratory work, practical classes in small groups, independent work based on textbooks and abstracts, consultations with teachers, preparation of qualifying work. Student-centered learning, self-study, problem-oriented learning aimed at the development of critical and creative thinking, learning through laboratory practice, distance education, etc.
Evaluation	Written exams, practice reports, presentations, current (modular) control, qualification work and its defense
6 - Program competencies	
Integral competence	Ability to solve complex specialized problems and practical problems of avionics and control systems during professional activities and in the learning process, which involves the use of theories and methods of engineering and is characterized by complexity and uncertainty of conditions.
General competences (GC)	GC 1. Ability to apply knowledge in practical situations. GC 2. Ability to search, process and analyze information. GC 3. Ability to identify, pose and solve problems. GC 4. Knowledge and understanding of the subject area and understanding of professional activity.

	GC 5. Ability to communicate in the state language both orally and in writing. GC 6. Ability to communicate in a foreign language. GC 7. Ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine. GC 8. Ability to preserve and increase moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology, use different types and forms physical activity for active recreation
Professional competencies of the specialty (PC)	PC1. Ability to carry out professional activities in the field of avionics autonomously and responsibly, adhering to the legal and regulatory framework, as well as national and international requirements. PC2. Ability to use the basics of electronics, circuitry in solving practical problems of avionics. PC3. Ability to develop and program microprocessor control systems. PC4. Ability to analyze and synthesize aircraft control systems. PC5. Ability to develop aircraft avionics and systems of ground complexes using information technology. PC6. Ability to mathematically describe and model physical processes in aircraft control systems. PC7. Ability to design avionics devices and systems using automated systems. PC8. Ability to describe and use modern technologies for the manufacture of avionics systems. PC9. Ability to evaluate the technical and economic characteristics of avionics systems and devices. PC10. Ability to justify decisions, work effectively autonomously and as part of a team.

7- Program learning outcomes

PLO1. Adapt to changes in professional technology, predict their impact on the end result.
PLO2. Autonomously acquire new knowledge in their subject and related fields from various sources for the effective solution of specialized tasks of professional activity.
PLO3. Responsible and qualified to set and solve problems related to the creation of avionics devices and systems.
PLO4. Understand the state and prospects of the subject area.
PLO5. To organize own professional activity, to choose optimum methods and ways of the decision of difficult specialized problems and practical problems in professional activity.
PLO6. Critically comprehend the basic theories, principles, methods and concepts in professional activities.
PLO7. Free to communicate on professional issues in state and foreign languages orally and in writing.
PLO8. Understand the principles of law and legal principles of professional activity in the field of avionics.
PLO9. Understanding of modern philosophical theories and the main achievements of world and national culture, their creative thinking and skills of application in professional activities, in particular, in communication with colleagues.
PLO10. Effectively plan and organize your working hours, maintain your own health and ability to work, including through active recreation and a healthy lifestyle.
PLO11. Develop technical requirements for avionics systems and devices; to design avionics systems and devices taking into account the requirements of the customer and regulatory and technical documentation.
PLO12. Analyze, calculate and design electrical and electronic avionics systems.
PLO13. Develop and program microprocessor control systems.
PLO14. Apply modern information technologies to ensure the functioning of aircraft and ground complexes.
PLO15. Develop mathematical models of aircraft as control objects.
PLO16. Be able to describe information processes related to avionics, analyze their noise immunity.

PLO17. Be able to create electronic equipment and devices of aircraft and ground complexes using computer-aided design systems. PLO18. Ensure the manufacturability of avionics systems with modern design tools, including automated and experimental. PLO19. Evaluate the technical and economic characteristics of the decisions taken to ensure the efficiency and high quality of development.	
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. Meets the personnel requirements to ensure the implementation of educational activities in the field of higher education in accordance with current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On approval of licensing conditions for educational activities of educational institutions" of December 30, 2015 № 1187)
Material and technical support	Training is carried out in training laboratories, computer classes 101, 233, 401, 402, 415, 425, 427, 428, 430, 511, 511a, 517, 518, 519, 520 of the radio engineering corps. Meets the requirements for material and technical support of educational activities in the field of higher education in accordance with current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On approval of licensing conditions for educational activities of educational institutions" of December 30, 2015 № 1187)
Information and educational-methodical support	The use of virtual learning environment of the National Aerospace University "Kharkiv Aviation Institute" and author's developments of scientific and pedagogical staff. Meets the requirements for informational and educational-methodological support of educational activities in the field of higher education in accordance with current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On approval of licensing conditions for educational activities of educational institutions" of December 30, 2015 № 1187)
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. If the education is in the state language, then in certain cases it may be decided to teach one or more subjects in English and/or other foreign languages.

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

3.1 List of EPP components

EPPC code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits (semester)	Form of final control
1	2	3	4
Mandatory components of the EPP			
MC1	Further Mathematics	15 (1,2,3)	exam
MC2	Physics	5 (2)	test
MC3	Algorithmization and Programming	13,5 (1.2)	exam
MC4	Engineering and Computer Graphics	5 (1)	test
MC5	Introduction to Avionics	3 (1)	test
MC6	Fundamentals of Metrology	5,5 (2)	test
MC7	Object-Oriented Design of Avionics Systems	5 (3)	exam
MC8	Object-Oriented Design of Avionics Systems (CW)	2 (4)	diff. test
MC9	Electrical Engineering	5 (3)	exam
MC10	Electronics and Fundamentals of Circuit Design	10 (3, 4)	exam
MC11	Fundamentals of Navigation	9,5 (3, 4)	exam
MC12	Fundamentals of Navigation (CW)	2 (5)	diff. test
MC13	Engineering Mechanics (Applied Mechanics and Fundamentals of Design)	4 (4)	exam
MC14	Fundamentals of Avionics System Simulation	9 (4.5)	exam
MC15	Automatic Control Theory	11 (5.6)	exam
MC16	Automatic Control Theory (CP)	2 (7)	diff. test
MC17	Computional Methods and Simulation Techniques	5 (5)	exam
MC18	Avionics Information and Measuring Devices	7 (5, 6)	exam
MC19	Avionics Information and Measuring Devices (CP)	2 (6)	diff. test
MC20	Actuators of Avionics Systems	3 (5)	test
MC21	Microcontrollers	8 (6, 7)	exam
MC22	Aircraft Control Systems	7,5 (6, 7)	exam
MC23	Vital Activity Safety, Labor Protection and Civil Protection	3 (7)	test
MC24	Control System Designing	6,5 (7, 8)	exam
MC25	Control System Designing (CP)	2 (8)	diff. test
MC26	Fundamentals of Building of Autonomous Navigation Systems	3,5 (7)	exam
MC27	Business Economics and Management	4 (8)	exam
MC28	Manufacturing Process of Avionics Devices	3 (8)	exam
MC29	Academic Training	3 (2)	test
MC30	Introductory Training	3 (4)	test
MC31	Practical Training	3 (6)	test
MC32	Thesis for Bachelor Degree	9 (8)	certification
Total amount of mandatory components:		**179**	
Selective components of the OP *			
Humanitarian unit (Soft Skills)			
SC1	Humanities or Economic Elective Course	3 (1)	test
SC2	Language competences (foreign language)	6 (1, 2)	diff. test
SC3	Ukrainian studies	3 (1)	test
SC4	Legal competence	3 (2)	test
SC5	Formation of a Systemic Scientific Worldview	3 (3)	test

SC6	Communications	3 (4)	test
SC7	Mathematics and Technics Course of Choice	5 (4)	test
Block of disciplines of professional orientation MINOR **			
SC8	MINOR. Discipline 1	5 (5)	exam
SC9	MINOR. Discipline 2	5 (6)	exam
SC10	MINOR. Discipline 3	5 (7)	exam
SC11	MINOR. Discipline 4	5 (8)	exam
Selected disciplines ***			
SC12	Discipline of individual choice 1	5 (6)	exam
SC13	Discipline of individual choice 2	5 (7)	exam
SC14	Discipline of individual choice 3	5 (8)	exam
The total amount of sample components:		**61**	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		**240**	

*The applicant chooses one of the disciplines offered in the lists / blocks of educational components SC1 - SC7, thus providing mastery and deepening of general competencies and learning outcomes aimed at acquiring social skills in accordance with the requirements of the specialty standard. The lists of constituent educational components SC1 - SC7 can be increased and updated by the decision of the branch NMC.

**The applicant can choose any block of disciplines of the MINOR professional direction. Blocks of MINOR professional disciplines can be increased and updated by the decision of the branch NMC.

*** General university block, in which the disciplines to choose are offered by the departments of the University or other departments according to the directions of their activity or scientific directions / schools.

The applicant, who is enrolled on the basis of complete general secondary education, carries out an educational-professional program in the amount of 240 ECTS credits.

The applicant, who is enrolled on the basis of the degree of junior bachelor (educational qualification level "Junior Specialist"), performs an educational and professional program in the amount of 240 ECTS credits. At the same time KHAI recognizes and recalculates:

– no more than 120 ECTS credits obtained in the field of knowledge 17 Electronics and Telecommunications;

– not more than 60 ECTS credits obtained in other specialties:

– not more than 60 ECTS credits received under the previous professional higher education program.

According to the principles of the competence approach to higher education, the re-enrollment of the results of previously completed disciplines in accordance with the individual curriculum is carried out at the request of the applicant on the basis of the Regulation "On re-enrollment of disciplines "Kharkiv Aviation Institute"(https://khai.edu/ua/university/normativna-baza/polozheniya1/polozhennya-yaki-regulyuyut-poryadok-zdijsnennya-osvitnogo-procesu/polozhennya-pro-poryadok-perezarahuvannya/) by comparison: compliance with the content of the discipline of educational and professional program (EPP); planned learning outcomes in the relevant discipline; total hours and ECTS credits; forms of final control, etc.

3.2 Structural and logical scheme of EPP

The structural and logical scheme (Appendix A) of the educational program reflects the sequence of studying its components, both mandatory and optional. The individual trajectory of higher education is chosen by the applicant, which is realized through the selection of elective components in accordance with the Regulation "On ensuring the right of students to choose academic disciplines."

3.3 Formation of competencies (general, professional (special)) and program learning outcomes of the mandatory components

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
1.	**MC1**	Further mathematics	**Goal:** to form professional competencies in the application of mathematical methods in professional activities **Task:** formation of a system of professional knowledge and practical skills in linear algebra and analytical geometry, differential and integral calculus, series theory, operational calculus, variational calculus, probability theory, mathematical statistics and the theory of random processes, numerical methods	GC1 GC2	PC6	PLO2 PLO6
2.	**MC2**	Physics	**Goal:** to form students' competence in the application of modern physics in professional activities, ideas about the modern physical picture of the world, to provide knowledge of the most important principles and laws that determine the structure and forms of motion of matter, preparing them for quality study of general and special disciplines **Task:** formation of a system of professional knowledge and practical skills in the application of methods of mechanics, oscillations and waves, electricity and magnetism, wave optics, heat engineering, thermodynamics for the analysis of technical objects	GC1 GC2 GC4	PC6	PLO2 PLO6
3.	**MC3**	Algorithmization and Programming	**Goal:** mastering by students of methods and means of designing and realization of algorithms of data processing, and also the structural approach to construction of the software of computerized systems **Task**: study of methods of designing algorithms, mastering syntactic constructions in high-level programming languages, as well as acquiring skills in designing and implementing software.	GC1 GC2	PC5 PC6	PLO1 PLO2 PLO6 PLO14 PLO16
4.	**MC4**	Engineering and Computer Graphics	**Goal**: mastering by applicants of principles of execution of design documentation with application of computer technologies **Task:** formation of applicants' professional knowledge and practical skills in design documentation (ESKD), execution of parts and assemblies in accordance with ESKD, general principles of integrated computer technology, use of standard software products in the development of design documentation, use of ESKD and ESDD in reporting documentation	GC1 GC2	PC5 PC7	PLO1 PLO2 PLO6 PLO16 PLO17
5.	**MC5**	Introduction to Avionics	**Goal**: provide general ideas about the object and subject of the specialty. Develop the ability to conduct research on the properties of the simplest automatic control systems and basic skills of professional	GC1 GC2 GC4	PC1 PC4	PLO1 PLO2 PLO4

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
			communication. **Task**: to give students systematic knowledge of subjects and objects of specialty, to acquaint with the scope of avionics systems, as well as engineering of mobile applications, navigation systems, technical vision systems, basic control principles, automatic control systems, ACS characteristics, applied mathematical programs (Maple)			PLO5 PLO6 PLO14
6.	**MC6**	Fundamentals of Metrology	**Goal:** mastering by applicants of basic competencies in the field of metrological support of design of control systems and application of modern standards **Task**: formation of students' professional knowledge and practical skills on the theoretical foundations of metrology, basic concepts, means of measurement and patterns of measurement results, measurement errors, algorithms for processing multiple measurements, metrological support; structure and functions of metrological services, standardization, its legal basis, international standardization organizations; systems of standards, certification, the concept of product quality, consumer protection; rules and procedures for certification; certification of quality systems in Ukraine	GC1 GC2 GC4	PC6 PC9	PLO1 PLO2 PLO4 PLO6 PLO11
7.	**MC7**	Object-Oriented Design of Avionics Systems	**Goal:** formation of applicants' basic knowledge and skills required in the construction of object-oriented software for the design and implementation of aircraft control systems. **Task:** gaining skills in the development of object-oriented programs with a graphical user interface to perform design tasks for building control systems for aircraft, namely engineering calculations, plotting functions, obtaining and processing photos and videos	GC1 GC2 GC3 GC4	PC6 PC7 PC10	PLO1 PLO2 PLO3 PLO5 PLO6 PLO14
8.	**MC8**	Object-Oriented Design of Avionics Systems (CW)	**Goal:** formation of practical skills and abilities necessary for the construction of object-oriented software for the design and implementation of aircraft control systems. **Task:** practical consolidation of skills in the development of object-oriented programs with a graphical user interface to perform design tasks for building control systems for aircraft, namely engineering calculations, plotting functions, obtaining and processing photos and videos	GC1 GC2 GC3 GC4	PC6 PC7 PC10	PLO1 PLO2 PLO3 PLO5 PLO6 PLO14
9.	**MC9**	Electrical Engineering	**Goal:** mastering by applicants of the principles of application of the laws	GC1	PC2	PLO2

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
			of electrical engineering for the design of automation systems **Task**: formation of students' professional knowledge and practical skills in the basic laws of electrical engineering, the theory of electromechanical systems	GC2 GC4	PC6	PLO4 PLO6 PLO12
10.	**OK10**	Electronics and Fundamentals of Circuit Design	**Goal:** mastering by applicants of theoretical bases of construction of elements of electronic equipment, principles of their work and principles of work of modern electronic devices. **Task:** to give students systematic knowledge and practical skills in the formation of circuit solutions in the construction of automatic control system, the choice of functional electronic elements, experimental study of the functional properties of electronic devices and circuits	GC1 GC2 GC4	PC2 PC6	PLO1 PLO2 PLO4 PLO6 PLO12 PLO17
11.	**MC11**	Fundamentals of Navigation	**Goal:** study of methods of obtaining information about the location of moving objects and their trajectories on the basis of various navigation methods and principles of navigation systems. **Task:** to provide applicants with systematic knowledge related to the application of various methods of calculations and modeling used in the navigation of moving objects with the use of modern computer technology	GC1 GC2 GC4	PC1 PC6	PLO1 PLO2 PLO4 PLO5 PLO6 PLO11 PLO14
12.	**MC12**	Fundamentals of Navigation (CW)	**Goal:** practical application of methods of obtaining information about the location of moving objects and their trajectories on the basis of various navigation methods and principles of operation of navigation systems. **Task:** to form in applicants systematized skills and abilities related to the practical application of various methods of calculations and modeling used in the navigation of moving objects with the use of modern computer technology	GC1 GC2 GC4	PC1 PC6	PLO1 PLO2 PLO4 PLO5 PLO6 PLO11 PLO14
13.	**MC13**	Engineering Mechanics (Applied Mechanics and Fundamentals of Design)	**Goal:** mastering by applicants of methods of formation and calculation of designs of devices of exact mechanics **Task**: formation of applicants' professional knowledge and practical skills in methods of developing models of electromechanical objects, methods of developing models of electronic objects, design techniques, preparation of technical documentation, design elements, circuit diagrams, ESKD and standards in instrumentation, classification of technical objects which are designed, principles of operation and	GC1 GC2	PC6 PC7	PLO2 PLO4 PLO6 PLO12

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
			schemes of technical objects which are designed			
14.	**MC14**	Fundamentals of Avionics Systems Simulation	**Goal**: to acquaint applicants with the basic concepts, definitions, ideas, principles and methods of modeling of control systems and to carry out with their help research of dynamic properties of objects of automatic control **Task:** gaining skills in building verbal, graphic, mathematical, machine models and experimental study of functional properties of automatic control objects, solving problems of structural and parametric identification of mathematical models in time and frequency domains	GC1 GC2 GC4	PC4 PC6	PLO1 PLO2 PLO4 PLO5 PLO6 PLO11 PLO14 PLO15
15.	**MC15**	Automatic Control Theory	**Goal:** study of the basic provisions, theoretical bases of development of modern systems of automatic control; modern principles, schemes and methods of building control systems, their characteristics **Task:** acquisition by students of skills of forming the structure of the automatic control system, development of functional and structural schemes, construction of mathematical models of functional elements, solving problems of analysis and synthesis of the system, experimental study of functional properties of the system	GC1 GC2 GC4	PC4 PC6 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO14 PLO15
16.	**MC16**	Automatic Control Theory (CP)	**Goal:** practical consolidation of the studied theoretical foundations of the development of modern automatic control systems; modern principles, schemes and methods of building control systems, their characteristics **Task:** gaining practical skills and abilities of forming the structure of automatic control system, developing functional and structural schemes, building mathematical models of functional elements, solving problems of analysis and synthesis of the system, experimental study of functional properties of the system, forming requirements for technical design of control system	GC1 GC2 GC4	PC4 PC6 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO14 PLO15
17.	**MC17**	Computational Methods and Simulation Technics	**Goal:** formation of basic knowledge and skills of applicants related to the application of methods of calculation and modeling on a computer during the design of basic elements of control systems **Task**: to give students systematic knowledge related to the application of various methods of calculations and modeling used in the design of basic elements of control systems using modern computer technology	GC1 GC2 GC4	PC5 PC6	PLO1 PLO2 PLO4 PLO5 PLO6 PLO14

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
						PLO16
18.	**MC18**	Avionics Information and Measuring Devices	**Goal:** mastering by applicants of the basic concepts and methods of calculation of measuring devices of control systems of aircraft. **Task:** formation of applicants' professional knowledge and practical skills on the theoretical basis of measuring devices of motion parameters of objects, made on different physical principles, methods of mathematical description of statics and dynamics of measuring parameters of motion of objects; selection and substantiation of measuring parameters of objects movement; methods of extracting useful information, complexing and improving the accuracy of measurement of various parameters of technical systems, principles of construction and operation of control devices of units of aircraft control systems; methods of experimental research and testing of measuring devices	GC1 GC2 GC4	PC1 PC2 PC5 PC6 PC7 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO12 PLO14 PLO15 PLO16 PLO19
19.	**MC19**	Avionics Information and Measuring Devices (CP)	**Goal:** practical improvement of basic methods of calculation of measuring devices of aircraft control systems by applicants of basic knowledge. **Task:** practical formation of applicants' abilities and skills of calculation and application of measuring devices of motion parameters of objects, made on different physical principles, methods of mathematical description of statics and dynamics of measuring instruments of motion parameters of objects; selection and substantiation of measuring parameters of objects movement; methods of extracting useful information, complexing and improving the accuracy of measurement of various parameters of technical systems, principles of construction and operation of control devices of units of aircraft control systems; methods of experimental research and testing of measuring devices	GC1 GC2 GC4	PC1 PC2 PC5 PC6 PC7 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO12 PLO14 PLO15 PLO16 PLO19
20.	**MC20**	Actuators of Avionics Systems	**Goal:** to study the basic provisions, physical principles of operation of electric, hydraulic and pneumatic drives, their static and dynamic characteristics; features of the use of actuators in aircraft control systems **Task**: gaining skills in analyzing the characteristics and methods of calculating the drives of aircraft control systems, providing remote control, mastering methods of mathematical description of drives of	GC1 GC2 GC4	PC4 PC6 PC9	PLO1 PLO2 PLO4 PLO5 PLO6 PLO11 PLO14

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
			different types used in aircraft control systems			PLO15
21.	**MC21**	Microcontrollers	**Goal:** mastering by applicants of the principles of internal organization of basic models of single-chip microcontrollers (MC), construction of digital controllers based on them and methodological approaches to the development of their software. **Task:** formation of applicants' professional knowledge and practical skills in the analysis of the technical task for the development of a digital controller and a reasonable choice of elements of digital microcircuitry for its implementation; principles of development and testing of digital controller software elements for data collection and processing and generation of real-time control signals	GC1 GC2 GC4	PC2 PC3	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO12 PLO13
22.	**MC22**	Aircraft Control Systems	**Goal:** formation of applicants' knowledge and skills necessary for the development of aircraft control systems. **Task:** on providing applicants with knowledge of the theoretical foundations, principles of construction, features of technical performance and characteristics of aircraft control systems; laws and methods of control, algorithms of functioning, typical structures and dynamic properties and characteristics of accuracy of control systems of mobile objects, and also about methods of their technical realization.	GC1 GC2 GC3 GC4	PC1 PC2 PC4 PC5 PC6 PC7	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO14 PLO15 PLO16 PLO17 PLO18 PLO19
23.	**MC23**	Vital Activity Safety, labor Protection and Civil Protection	**Goal:** to form in applicants skills of observance of rules of safety and ecology in professional activity **Task:** formation of applicants' professional knowledge and practical skills in the basics of ecology, applied and theoretical aspects, analysis of environmental problems of Ukraine, the application of legislation in the field of environmental protection; structural and functional organization of man in terms of its interaction with the environment; application of methods and means of ensuring life safety	GC1 GC4 GC7 GC8	PC1 PC10	PLO1 PLO2 PLO4 PLO5 PLO6 PLO7 PLO10
24.	**MC24**	Control Systems Design	**Goal:** formation of applicants' knowledge and skills necessary for the design of automatic control systems of aircraft	GC1 GC2	PC1 PC4	PLO1, PLO2 PLO3, PLO4

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
			Task: study of information organizational, methodological, technical, algorithmic and linguistic bases of design automatic aircraft control systems	GC3 GC4	PC6 PC7 PC9 PC10	PLO5, PLO6 PLO11 PLO14 PLO15 PLO16 PLO19
25.	**MC25**	Control Systems Design (CP)	**Goal:** formation of applicants' practical skills and abilities necessary for the design of automatic control systems for aircraft **Task:** practical consolidation of information, organizational, methodological, technical, algorithmic and linguistic bases of design automatic aircraft control systems	GC1 GC2 GC3 GC4	PC1 PC4 PC6 PC7 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO14 PLO15 PLO16 PLO19
26.	**MC26**	Fundamentals of Building Autonomous Navigation Systems	**Goal:** mastering by applicants of the basic principles of hardware construction and algorithmic support of autonomous navigation systems built on the basis of platformless inertial navigation systems (BINS) **Task**: formation of students' professional knowledge of the theoretical foundations of BINS construction and practical skills in developing and analyzing algorithms for filtering signals and calculating navigation parameters of moving objects, complexing BINS meters, ensuring fault tolerance BINS and reconfiguration of hardware	GC1 GC2 GC4	PC4 PC5 PC6 PC7 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO14 PLO15 PLO16 PLO17 PLO19
27.	**MC27**	Business Economics and Management	**Goal:** mastering by applicants of methods of the analysis of an economic condition of the enterprise and carrying out of actions of effective management **Task**: formation of the system of professional knowledge and practical skills of applicants for the feasibility of designing aircraft control systems, the organization of management activities in the modern	GC1 GC2 GC3 GC4 GC5 GC7	PC4 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
			production of automation systems			PLO7 PLO8 PLO11
28.	**MC28**	Manufacturing Process of Avionics Devices	**Goal:** mastering by applicants of the basic principles of development of technologies of manufacturing of elements of control systems of aircraft **Task**: to form in students a clear system of bases of theoretical knowledge, practical abilities and skills concerning application of modern technologies of production of elements of ACS, independent modeling and research on the PC of process of realization of technologies of production of elements of ACS, definition of the tactical and technical characteristics confirming nominal quality of products	GC1 GC2 GC3 GC4	PC1 PC8 PC9	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO18 PLO19
29.	**MC29**	Academic Training	**Goal**: providing knowledge on the preparation of student work in compliance with the accepted requirements for information resources. **Task:** acquaintance with the organization of information and Internet resources, the simplest means of access to them, the rules of compiling the general components of student work, the implementation of practical tasks	GC1 GC2 GC4 GC5	PC1 PC10	PLO1 PLO2 PLO4 PLO6 PLO7
30.	**MC30**	Introductory Training	**Goal:** acquisition by applicants and consolidation of theoretical knowledge and practical skills in the use of measuring equipment in the regulation, adjustment and testing of electronic equipment of control systems with subsystems of technical vision. **Task:** acquaintance with industrial means of measuring equipment and gaining practical experience in measuring the characteristics of electrical quantities and signals	GC1 GC2 GC4 GC5	PC1 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11 PLO19
31.	**MC31**	Practical Training	**Goal:** mastering by applicants modern methods, forms of organization and tools in the field of development and manufacture of elements and systems of avionics. **Task:** formation of applicants' knowledge, professional skills and abilities for independent decision-making during specific work in real market and production conditions, education of the need to systematically update knowledge and creatively apply it in practice;	GC1 GC2 GC3 GC4 GC5 GC7	PC1 PC8 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO11

№ for / n	EPPS code	The name of the OP component	The purpose and objectives of the component of the educational program	Formation of competencies		Program learning outcomes
				General	Special (professional)	
			mastering by applicants of a working profession from among the specialties of the branch corresponding to the specialty of training.			PLO18 PLO19
32.	**MC32**	Thesis for Bachelor Degree	**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 the standard of higher education. **Task:** systematization, consolidation and expansion of theoretical knowledge obtained in the process of learning the educational-professional program "Systems of Autonomous Navigation and Adaptive Control of Aircraft». Training of bachelor's degree specialists, 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 of methods of researches and experimentation, physical or mathematical modeling, use of modern information technologies in the course of the decision of problems which are provided by tasks for diploma designing; determining the level of training of graduates to the requirements of educational degrees, the characteristics of the specialist, his readiness and ability to work independently in a market economy, modern production, progress in science, technology and culture.	GC1 GC2 GC3 GC4 GC5 GC6 GC7 GC8	PC1 PC2 PC3 PC4 PC5 PC6 PC7 PC8 PC9 PC10	PLO1 PLO2 PLO3 PLO4 PLO5 PLO6 PLO7 PLO8 PLO9 PLO10 PLO11 PLO12 PLO13 PLO14 PLO15 PLO16 PLO17 PLO18 PLO19

Selective components, their content, formation of competencies (special, professional) and definition of learning outcomes are presented in the work programs of disciplines and / or syllabi on the site in the section "Short description, structure and educational components of educational programs and components". of navigation and adaptive control of aircraft "specialty 173" Avionics ":
(https://khai.edu/ua/education/osvitni-programi-i-komponenti/osvitni-programi-bakalavriv/sistemi-avtonomnoi-navigacii1/)

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4 FORM OF CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Attestation of the graduate in the educational-professional program " Systems of Autonomous Navigation and Adaptive Control of Aircraft" in the specialty 173 "Avionics" is carried out in the form of defense of bachelor's thesis and ends with the issuance of a standard document on awarding him a bachelor's degree electronics and telecommunications.

Certification is carried out openly and publicly.

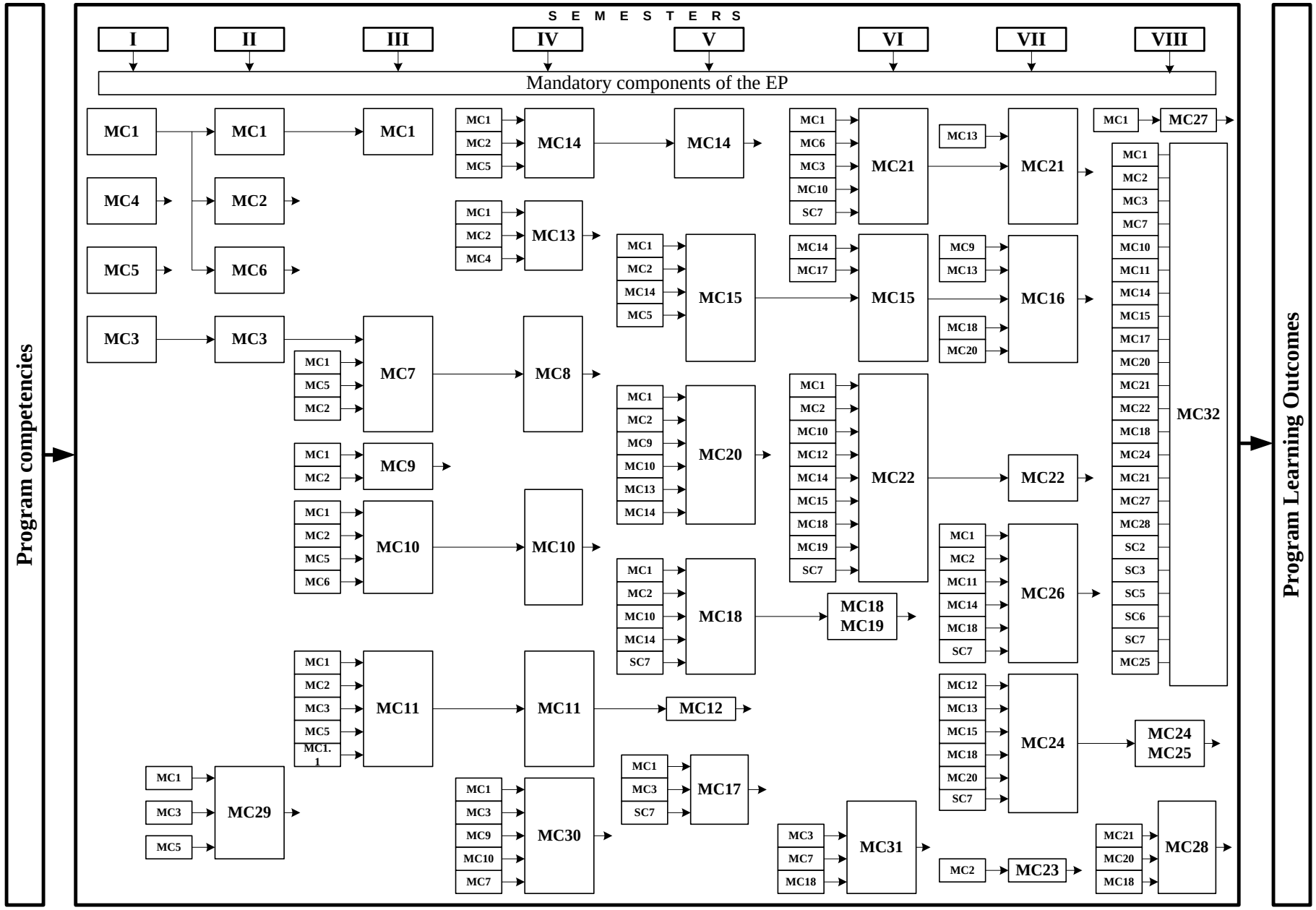
5 MATRIX OF COMPLIANCE OF PROGRAM COMPETENCES WITH MANDATORY COMPONENTS OF THE EDUCATIONAL PROFESSIONAL PROGRAM

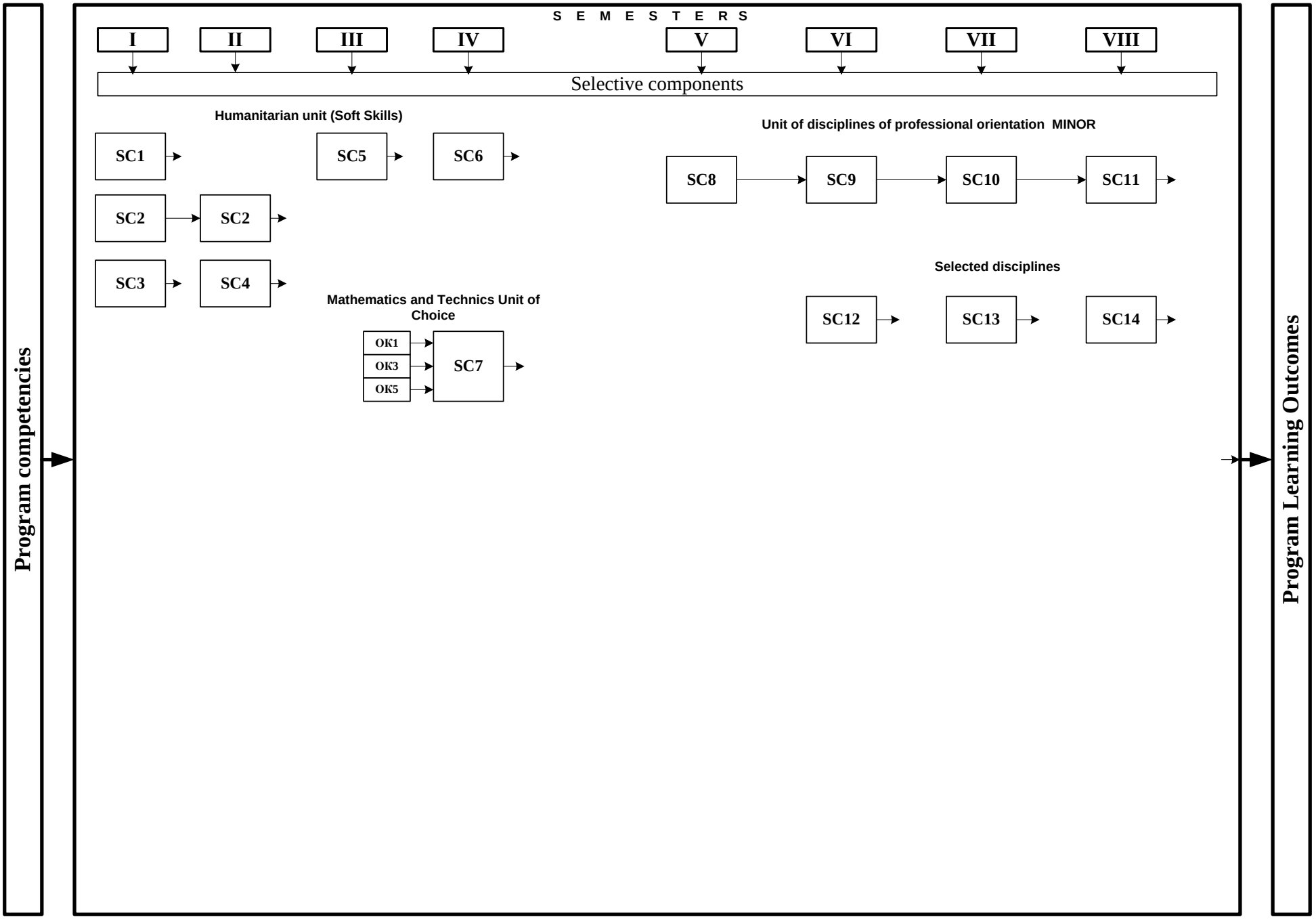
Program competencies	Mandatory Components of the Educational program																														
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	MC9	MC10	MC11	MC12	MC13	MC14	MC15	MC16	MC17	MC18	MC19	MC20	MC21	MC22	MC23	MC24	MC25	MC26	MC27	MC28	MC29	MC30	MC31	MC32
GC1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
GC2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+
GC3							+	+														+		+	+		+	+			+	+
GC4		+			+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
GC5																											+		+	+	+	+
GC6																																+
GC7																							+				+				+	+
GC8																							+									+
PC1					+						+	+						+	+			+	+	+	+			+	+	+	+	+
PC2									+	+								+	+		+	+										+
PC3																					+											+
PC4					+									+	+	+				+		+		+	+	+	+					+
PC5			+	+													+	+	+			+				+						+
PC6	+	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+		+	+	+						+
PC7				+			+	+					+					+	+			+		+	+	+						+
PC8																												+			+	+
PC9						+												+	+	+				+	+	+	+	+		+	+	+
PC10							+	+							+	+		+	+				+	+	+	+	+		+	+	+	+

6 MATRIX OF CONFORMITY OF PROGRAM LEARNING RESULTS (PRN) TO THE RELEVANT COMPONENTS OF THE EDUCATIONAL PROFESSIONAL PROGRAM

Program learning outcomes	Mandatory Components of the Educational program																															
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	MC9	MC10	MC11	MC12	MC13	MC14	MC15	MC16	MC17	MC18	MC19	MC20	MC21	MC22	MC23	MC24	MC25	MC26	MC27	MC28	MC29	MC30	MC31	MC32
PLO 1			+	+	+	+	+	+		+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PLO 2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PLO 3							+	+							+	+		+	+		+	+		+	+	+	+	+		+	+	+
PLO 4					+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PLO 5					+		+	+			+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+
PLO 6	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PLO 7																							+				+		+	+	+	+
PLO 8																											+					+
PLO 9																																+
PLO 10																							+									+
PLO 11						+					+	+		+	+	+		+	+	+		+		+	+	+	+			+	+	+
PLO 12									+	+			+					+	+		+											+
PLO 13																					+											+
PLO 14			+		+		+	+			+	+		+	+	+	+	+	+	+		+		+	+	+						+
PLO 15														+	+	+		+	+	+		+		+	+	+						+
PLO 16			+	+													+	+	+			+		+	+	+						+
PLO 17				+						+												+				+						+
PLO 18																						+									+	+
PLO 19																		+	+	+		+		+	+	+	+			+	+	+

Appendix A
STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROFESSIONAL PROGRAM




Program competencies
S E M E S T E R S
I
II
III
IV
V
VI
VII
VIII
Selective components
Humanitarian unit (Soft Skills)
SC1
SC5
SC6
SC2
SC2
SC3
SC4
Mathematics and Technics Unit of Choice
OK1
OK3
OK5
SC7
Unit of disciplines of professional orientation MINOR
SC8
SC9
SC10
SC11
Selected disciplines
SC12
SC13
SC14
Program Learning Outcomes