MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
KHARKIV NATIONAL AUTOMOBILE AND HIGHWAY UNIVERSITY

EDUCATIONAL AND PROFESSIONAL PROGRAM

"MOTOR VEHICLE TRANSPORT"

First (bachelor) level of higher education
in specialty G9 "Applied Mechanics"
fields of knowledge G "Engineering, Manufacturing
and Construction"
Qualification "Bachelor in applied mechanics"

APPROVED
by the Scientific Council of KhNAHU
Minutes № 77 dated July 4, 2025

The Head of the Scientific Council

Viktor BOHOMOLOV

The educational program is implemented from
"01" September 2025
Order № 110 of July 07, 2025

Rector

Viktor BOHOMOLOV

Kharkiv 2025

PREFACE

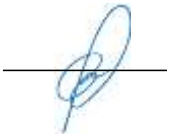
1. Developed by the project group:

Yurii DUDUKALOV, professor of the Department of Mechanical Engineering Technology and Machine Repair, guarantor educational and professional program

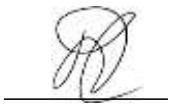
Evgeny DUBININ, professor of the Department of Mechanical Engineering Technologies and Machine Repair

Andriy MOLODAN, professor of the Department of Mechanical Engineering Technologies and Machine Repair

Tetyana YERMAKOVA, Student of Group APM-31-22



Denys BYSTROV, Design Engineer of the Department of General Layout of Machines of the State Corporation "Ukroboronprom" SE "KCBM named after O.O. Morozov"



2. Recommended by the methodological commission of the automotive faculty
Protocol № 10 dated June 20, 2025.

3. Approved by the Methodical Council of KhNAHU
Protocol № 8 dated June 25, 2025.

4. Reviewers:
Oleksandr PERMYAKOV, Doctor of Technical Sciences, Professor, Head of the Department of Mechanical Engineering Technologies and Metal-Cutting Machine Tools of NTU Kharkiv Polytechnic Institute;

Semen GOLOVKO, Deputy Head of Production Management at PJSC «FED» Corporation;

Vadym ANOSOV, General Director, Private Joint-Stock Company Kharkiv Tractor Plant;

Oleksandr FOTCHENKOV, Director of the State Enterprise Kharkiv Automobile Plant.

The educational program is developed in accordance with the Higher Education Standard in specialty 131 "Applied Mechanics" of the field of knowledge 13 "Mechanical Engineering" for the first (bachelor's) level of higher education, which was approved by the order of the Ministry of Education and Science of Ukraine No. 865 dated 06/20/2019.

1. PROFILE OF THE EDUCATIONAL PROGRAM

1 - General information	
Full name of the institution of higher education and the department responsible for the implementation of the educational program	Kharkiv National Automobile and Highway University, the Department of Mechanical Engineering Technology and Machine Repair
Level of higher education	First (bachelor's) level
Forms of study	Institutional (full-time, part-time, distance learning)
Degree of higher education and title of qualification in the original language	Degree of higher education - Bachelor Educational qualification - Bachelor in Applied Mechanics
Qualification in the diploma	Higher education degree – bachelor Specialty – G9 Applied Mechanics
Official name of the educational program	Educational and professional program "Applied Mechanics"
Type of diploma and scope of the educational program	Bachelor's degree, single, 240 ECTS credits, study period – 3 years 10 months. For a shortened study period – 180 ECTS credits, study period – 2 years 10 months.
Availability of accreditation	Certificate of accreditation of the educational program No. 11231 valid until 01.07. 2030.
Cycle/level	National qualification framework of Ukraine – level 6, FQ-EHEA – first cycle, EQF LLL – level 6.
Prerequisites	On the basis of complete general secondary education, on the basis of the "junior bachelor" or "professional junior bachelor" degree (on the basis of the "junior specialist" educational qualification level).
Language(s) of instruction	Ukrainian and/or English languages.
The term of validity of the educational program	4 years. Until the end of the validity period of the accreditation certificate or the next review and revision in accordance with changes in the regulatory framework of Ukraine in the field of higher education.
Internet address of the permanent placement of the description of the educational program	https://www.khadi.kharkov.ua/education/katalog-osvitnikh-program/131-prikladna-mekhanika/ , tab "Bachelor" - "Educational programs".

2 - The goal of the educational program	
The goal of the program: To provide education in the field of knowledge "Engineering, Production and Construction" with wide access to employment. To provide theoretical and practical training of specialists capable of solving complex specialized tasks and practical problems when performing professional duties in the field of knowledge "Engineering, Production and Construction" in the profile of applied mechanics with the application of theoretical provisions and practical skills to create competitive technologies, equipment and facilities for machine-building and repair industries.	
3 – Characteristics of the educational program	
Subject area (field of knowledge, specialty)	Fields of knowledge G "Engineering, Manufacturing and Construction" , Specialty G9 "Applied Mechanics". *The objects of professional activity of graduates are:* structures, machines, equipment, mechanical and biomechanical systems and complexes, processes of their design, manufacturing, research and operation.. *Learning goals:* professional engineering activities in the field of design, production and operation of technical systems, machines and equipment, robotics and technical means and complexes, development of technologies of machine-building industries. *Theoretical content of the subject area:* general laws of theoretical mechanics and their applied applications, theoretical principles of machine design, technologies of machine-building industries, mechanics of fluids and gases, machine parts and structures, forecasting of operational properties of technical systems. *Methods, techniques and technologies:* physical and mathematical methods of calculating statics, dynamics and stability of elements and structures; analytical, numerical and algorithmic methods of modeling kinematics and dynamics of machines, analysis of the stress-strain state of structural elements; methods of design, control, research, development of technologies for manufacturing and assembling elements of machines and structures; information technologies in engineering research, design and production; methods and means of numerical program control of technological equipment; technologies of automated machine-building industries. *Tools and equipment:* machine tools, tools, technological and control devices, control and measuring equipment, numerical control systems, drives for machine tools and robotic systems.
Orientation of the educational program	The main orientation of the program is practical professional activity in the field of G «Engineering, Production and Construction», G9 «Applied Mechanics». The orientation of the program is applied. The main approach to teaching: problem-oriented, student-centered and result-oriented educational process with elements of self-study.

The main focus of the educational program and specialization	Special education in the field of G «Engineering, Production and Construction» in the specialty G9 «Applied Mechanics», which is aimed at forming the integral competence of a bachelor in solving problems of applied mechanics in machine-building and repair production with ***an emphasis*** on manufacturing, ensuring the reliability of machines, their modernization and repair. ***Keywords:*** applied mechanics; manufacturing technologies, CNC machines; repair production; modernization of machines; repair and diagnostic equipment; production and transport process.
Features of the program	The program features: – formation of design and technological training for solving problems of designing machines, equipment and technologies of machine-building and repair production using modern CNC equipment; – orientation on acquiring skills in the practical application of CAD/CAM/CAE systems for developing design and technological projects for manufacturing, modernization and repair of machines. The opportunity to use modern CNC machine tool equipment in the educational process is provided by the Haas Technical Education Center (HTEC) at KhNADU. Applicants can master modern methods of working on CNC machine tools: ST20 lathe and VF2 milling machine. KhNADU received the status of a strategic partner of Autodesk, which allows applicants to use a large package of educational licenses for current software products. To study the dynamics of machine movement, a high-precision mobile registration and measuring complex based on accelerometers is used in classes (developer - Department of Mechanical Engineering Technology and Machine Repair KhNADU).
4 – Graduates' suitability for employment and further education	
Suitability for employment	Graduates have the opportunity to find employment in the field of mechanical engineering and machine repair at enterprises of various forms of ownership, machine-building and repair enterprises in positions (according to DK 003:2010): 3115 Technical specialists-mechanics; 3119 Other technical specialists in the field of physical sciences and technology.
Further education	The possibility of continuing studies at the second (master's) level of education (National qualification framework of Ukraine – 7th level, FQ-EHEA – second cycle, EQF LLL – 7th level), receiving postgraduate education in related and other specializations, professional development, academic mobility.

5 – Teaching and assessment	
Teaching and learning	Student-centered learning, self-study, problem-based learning, learning through lectures, laboratory and practical work. Internships at specialized enterprises and research institutions. Organizational forms: lectures, seminars, practical classes, laboratory classes in small groups (up to 8 people), independent work with the possibility of consultations with a teacher, individual classes, use of information and communication technologies (online lectures), internships at specialized enterprises and research institutions.
Assessment	Assessment of students' academic achievements is carried out according to the national scale (excellent, good, satisfactory, unsatisfactory; passed, failed); 100-point scale and ECTS scale (A, B, C, D, E, FX, F). *Current control:* defense of laboratory work and assignments for practical classes, test control, oral examination, evaluation of reports at seminar classes. *Final control:* exams and tests taking into account the accumulated points of current control, defense of coursework and projects, defense of a practice report. *Final certification:* public defense (demonstration) of the qualification work. *Types of control:* – by levels: self-control, control at the teacher level, control at the head of the department level, control at the dean's office level, control at the administration level, final control; – by term of conduct: operational (input, current, interim, final) and deferred.
6 – Software competencies	
Integral competence	The ability to solve complex specialized tasks and practical problems in applied mechanics or in the process of learning, which involves the application of certain theories and methods of mechanical engineering and is characterized by complexity and uncertainty of conditions.
General competences (CG)	**CG-1.** The ability for abstract thinking, analysis and synthesis.
	CG-2. Knowledge and understanding of the subject area and understanding of professional activity.
	CG-3. Ability to identify, pose and solve problems.
	CG-4. Ability to apply knowledge in practical situations.
	CG-5. Ability to work in a team.
	CG-6. Determination and persistence in relation to the tasks set and the responsibilities assumed.
	CG-7. Ability to learn and master modern knowledge.
	CG-8. Ability to communicate in a foreign language.
	CG-9. Skills in using information and communication technologies.

	CG-10. Skills in performing safe activities.
	CG-11. Ability to act socially responsibly and consciously.
	CG-12. Ability to search, process and analyze information from various sources.
	CG-13. Ability to evaluate and ensure the quality of work performed.
	CG-14. The ability to exercise one's rights and obligations as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of man and citizen in Ukraine.
	CG-15. The 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 engineering, to use various types and forms of physical activity for active recreation and leading a healthy lifestyle.
	CG-16. The ability to make decisions and act, adhering to the principle of inadmissibility of corruption and any other manifestations of dishonesty.
Special (professional) competences of the specialty (SC)	**SC-1.** Ability to analyze materials, structures and processes based on the laws, theories and methods of mathematics, natural sciences and applied mechanics.
	SC-2. Ability to assess the performance parameters of materials, structures and machines in operating conditions and find appropriate solutions to ensure a given level of reliability of structures and processes, including in the presence of some uncertainty.
	SC-3. Ability to conduct technological and technical-economic assessment of the effectiveness of using new technologies and technical means.
	SC-4. Ability to make the optimal choice of technological equipment, complete sets of technical complexes, have basic ideas about the rules of their operation.
	SC-5. Ability to use analytical and numerical mathematical methods to solve problems of applied mechanics, in particular to carry out calculations for strength, endurance, stability, durability, rigidity in the process of static and dynamic loading in order to assess the reliability of machine parts and structures.
	SC-6. Ability to perform technical measurements, obtain, analyze and critically evaluate measurement results.

	SC-7. Ability to use computer-aided design (CAD), manufacturing (CAM) and engineering research (CAE) systems and specialized application software to solve engineering problems in applied mechanics.
	SC-8. Ability to spatial thinking and reproduce spatial objects, structures and mechanisms in the form of projection drawings and three-dimensional geometric models.
	SC-9. Ability to present the results of one's engineering activities in compliance with generally accepted norms and standards.
	SC-10. Ability to describe and classify a wide range of technical objects and processes, based on deep knowledge and understanding of basic mechanical theories and practices, as well as basic knowledge of related sciences.
	SC-11. Ability to apply methods of applied mechanics to develop design and technological solutions during modernization and repair of machines.
	SC-12. Ability to design, implement and use additive technologies and technological processes based on repair and restoration equipment and CNC metalworking machines.
7 – Program learning outcomes (PLO)	
PLO-1. Select and apply suitable mathematical methods for solving problems of applied mechanics.	
PLO-2. Use knowledge of the theoretical foundations of fluid and gas mechanics, heat engineering and electrical engineering to solve professional tasks.	
PLO-3. Perform calculations for the strength, endurance, stability, durability, rigidity of machine parts.	
PLO-4. Assess the reliability of machine parts and structures during static and dynamic loading. RN-5.	
PLO-5. Perform geometric modeling of parts, mechanisms and structures in the form of spatial models and projection images and formulate the result in the form of technical and working drawings.	
PLO-6. Create and theoretically substantiate the designs of machines, mechanisms and their elements based on the methods of applied mechanics, general principles of design, the theory of interchangeability, standard methods for calculating machine parts.	
PLO-7. Apply regulatory and reference data to control the compliance of technical documentation, products and technologies with standards, technical conditions and other regulatory documents.	
PLO-8. Know and understand the basics of information technology, programming, practically use applied software to perform engineering calculations, process information and the results of experimental research.	
PLO-9. Know and understand related fields (fluid and gas mechanics, heat engineering, electrical engineering, electronics) and be able to identify interdisciplinary connections in applied mechanics at the level necessary to fulfill the requirements of the educational program.	

PLO-10. Know the designs, methods of selection and calculation, the basics of maintenance and operation of drives for machine tool and robotic equipment.
PLO-11. Understand the principles of operation of automated control systems for technological equipment, in particular microprocessor-based ones, select and use optimal automation tools.
PLO-12. Skills in the practical use of computer-aided design (CAD), production preparation (CAM) and engineering research (CAE) systems.
PLO-13. Assess the technical and economic efficiency of production.
PLO-14. Make the optimal selection of equipment and equipment for technical complexes.
PLO-15. Take into account the main factors of man-made impact on the environment and the main methods of environmental protection, labor protection and safety of life when making decisions.
PLO-16. Communicate freely on professional issues orally and in writing in the state and foreign languages, including knowledge of special terminology and management and interpersonal communication skills.
PLO-17. Be able to develop and apply additive technologies and technological processes for repairing machines using repair and restoration equipment and CNC metalworking machines.

8 – Resource support for program implementation	
Staff support	Full-time scientific and pedagogical workers with scientific degrees and/or academic titles, as well as highly qualified and experienced specialists (including part-time ones) are involved in the implementation of the program. In order to improve the professional level in the disciplines taught, all scientific and pedagogical workers improve their qualifications at least once every five years.
Material and technical support	The implementation of the educational program provides for: – compliance of the university's material and technical support with the requirements of the Licensing Conditions (Resolution of the Cabinet of Ministers of Ukraine No. 1187 dated 12/30/2015 "On Approval of the Licensing Conditions for the Conduct of Educational Activities of Educational Institutions" as amended on March 24, 2021); – research and independent work of students, educational and industrial internships, diploma design, which additionally involve the material and technical support of the university's practice bases; – educational website of the KhNADU https://dl2022.khadi-kh.com/

Informational and educational and methodological support	The implementation of the educational program provides for: – compliance of the educational and methodological support of the university with the requirements of the Licensing Conditions (Resolution of the Cabinet of Ministers of Ukraine No. 1187 dated 12/30/2015 "On Approval of the Licensing Conditions for the Conduct of Educational Activities of Educational Institutions" as amended on March 24, 2021); – availability of licensed specialized software in accordance with professionally oriented disciplines.
9 – Academic mobility	
National credit mobility	The implementation of the educational program involves: – advanced training of teachers; – participation of students and teachers in International and All-Ukrainian conferences and seminars.
International credit mobility	The implementation of the educational program provides for the possibility of: – participation of students in international conferences; – research internships of students under the Erasmus+ program.
Education of foreign students of higher education	There are no restrictions on the education of foreign citizens.

2. LIST OF EDUCATIONAL PROGRAM COMPONENTS AND THEIR LOGICAL SEQUENCE

2.1. List of components of the educational program

The code	Components of the educational program (study subjects, course projects (works), practices, qualification work)	Credits	Final control form
1	2	3	4
Required components (RC) of the educational program			
Components of humanitarian and socio-economic training			
RC 01	History of Ukraine and Ukrainian Culture	4,0	Test
RC 02	Foreign Language (for professional purposes)	7,0	Exam
RC 03	Ukrainian Language (for professional purposes)	3,0	Exam
RC 04	Philosophy	3,0	Exam
	That's all	17,0	
Components of natural science (fundamental) training			
RC 05	Chemistry	4,0	Exam
RC 06	Higher Mathematics	8,0	Exam
RC 07	Descriptive Geometry, Engineering and Computer Graphics	9,0	Exam
RC 08	Computer information systems and technologies	4,0	Test
RC 09	Physics	4,0	Exam
RC 10	Ecology	3,0	Test
RC 11	Strength of Materials	6,0	Exam
	That's all	38,0	
Components of professional training			
RC 12	Introduction to the profession	3,0	Test
RC 13	Materials of machine structures	6,0	Exam
RC 14	Theoretical Mechanics	9,0	Exam
RC 15	Modeling of technological systems	7,0	Exam
RC 16	Hydraulics, Hydraulic and Pneumatic Drives	4,0	Exam
RC 17	SAPR of products and technologies	6,0	Exam, CW
RC 18	Reliability of machines	6,0	Exam
RC 19	Theory of Mechanisms and Machines	7,0	Exam, CP
RC 20	Interchangeability, standardization and technical measurements	4,0	Exam, CW
RC 21	Programming of CNC equipment	4,0	Test
RC 22	Machine Elements	6,0	Exam, CW
RC 23	Electrical Engineering, Electronics and Microprocess	6,0	Exam
RC 24	Design of repair and diagnostic equipment for motor transport	6,0	Exam, CP
RC 25	Occupational safety and healthy lifestyle	3,0	Exam
RC 26	Design of technology for manufacturing machine parts	3,0	Test
RC 27	Technological foundations of mechanical engineering	4,0	Exam
RC 28	Economics of the enterprise	3,0	Exam
RC 29	Design of technology for repairing machine parts	4,0	Exam, CW
RC 30	Industrial robotics and robotic technological complexes	3,0	Exam, CW
RC 31	Organization of production and transport processes	6,0	Exam, CW
RC 32	Educational (technological) practice	3,0	Test*
RC 33	Educational (design) practice	3,0	Test*
RC 34	Educational (operational) practice	3,0	Test*

1	2	3	4
RC 35	Pre-graduate practice	3,0	Test*
RC 36	Performance of qualification work (QW)	3,0	Protection of the QW
	That's all	125,0	
	The total volume of Required components:	**180 credits**	
Elective components (EC) of the educational program			
Components of humanitarian and socio-economic training			
EC 1	Elective discipline 1	3,0	Test
EC 2	Elective discipline 2	3,0	Test
EC 3	Elective discipline 3	3,0	Test
EC 4	Elective discipline 4	3,0	Test
	That's all	12,0	
Components of natural science (fundamental) training			
EC 5	Elective discipline 5	3,0	Test
EC 6	Elective discipline 6	3,0	Test
EC 7	Elective discipline 7	3,0	Test
EC 8	Elective discipline 8	3,0	Test
	That's all	12,0	
Components of professional training			
EC 9	Elective discipline 9	4,0	Test
EC 10	Elective discipline 10	4,0	Test
EC 11	Elective discipline 11	4,0	Test
EC 12	Elective discipline 12	4,0	Test
EC 13	Elective discipline 13	4,0	Test
EC 14	Elective discipline 14	4,0	Test
EC 15	Elective discipline 15	4,0	Test
EC 16	Elective discipline 16	4,0	Test
EC 17	Elective discipline 17	4,0	Test
	That's all	36,0	
3. Basic military training [2]			
EC 18	Theoretical training "Basic military training"	3,0	Differential Test
	The total amount of Elective components:	**60,0 credits**	
	GENERAL VOLUME OF THE EDUCATIONAL PROGRAM	**240,0 credits**	

Note: * – Protection of the practice report.

[1] The selection of disciplines is carried out according to the catalog of elective disciplines: https://www.khadi.kharkov.ua/education/katalog-vibirkovikh-disciplin/bakalavr/.

It should be noted that the applicant has the right to choose any discipline from this catalog.

[2] EC 18 is mandatory for inclusion in the individual curriculum plans of higher education applicants of male Ukrainian citizens who are studying in the full-time or dual form of education.

Basis:

– Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine Regarding Certain Issues of Military Service, Mobilization and Military Registration" (No. 3633-ИХ), dated May 18, 2024;

– The procedure for conducting basic military training for citizens of Ukraine who are pursuing higher education and police officers, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 734 dated June 21, 2024;

– Letter of the Ministry of Education and Science of Ukraine 1/4893-2025 dated March 14, 2025.

For other categories of higher education applicants, citizens of Ukraine who are not subject to the requirement for mandatory inclusion in the individual curriculum, it is an optional educational component.

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM

Description of the logical sequence of studying the components of the educational program, presented in the form of a diagram (Fig. 1).

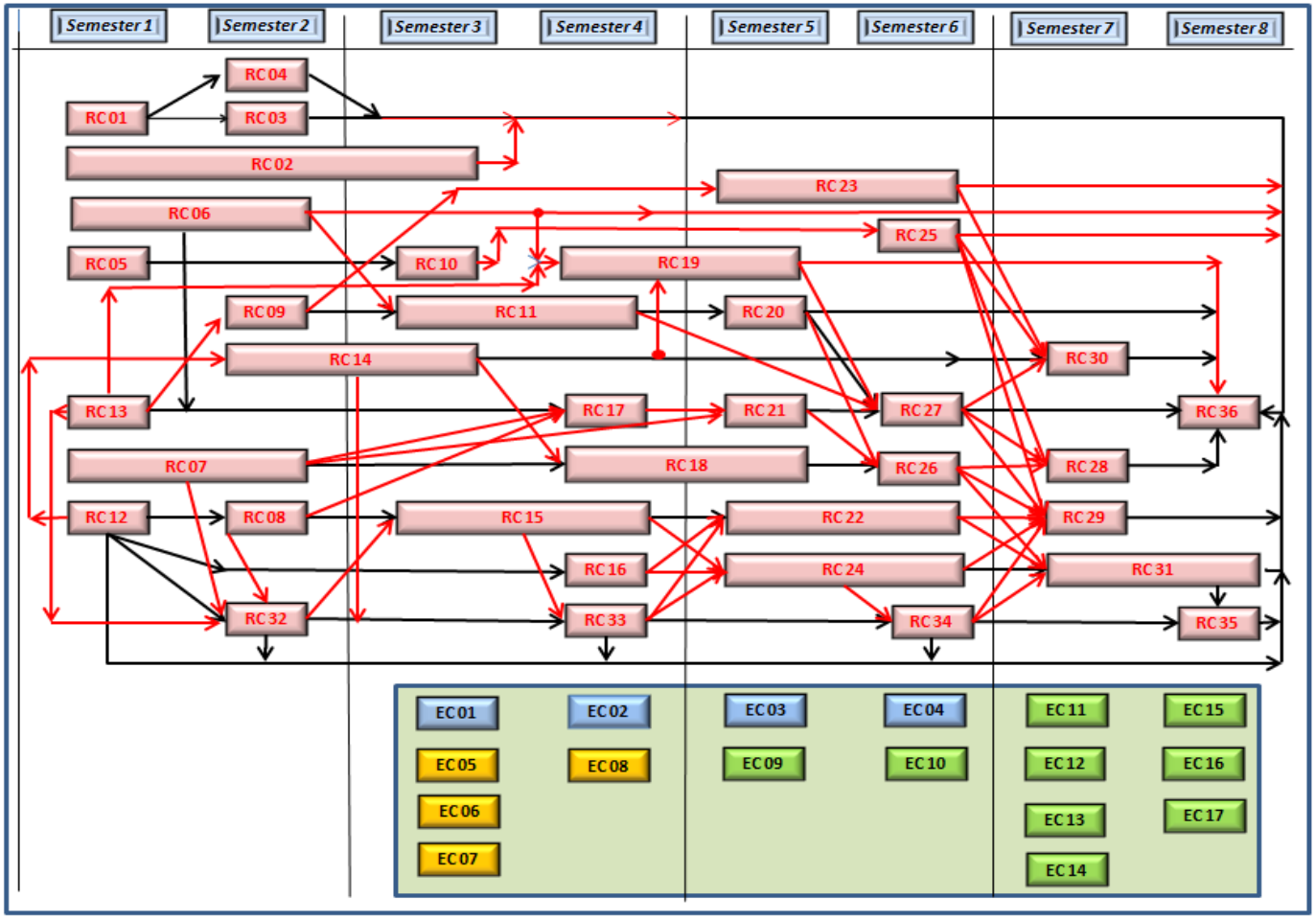


Fig. 1. Structural and logical scheme of studying the components of the educational program

4. FORM OF ATTESTATION OF HIGHER EDUCATION ACQUIRES

Forms of attestation of applicants of higher education	Certification of graduates is carried out in the form of a public defense of qualification work.
Requirements for qualifying work	The qualification work involves solving a complex specialized task or practical problem of applied mechanics in the field of mechanical engineering and machine repair, characterized by complexity and uncertainty of conditions, with the use of theories and methods of mechanical engineering. Also, the qualification work should not contain academic plagiarism, fabrications, falsifications and other types of academic dishonesty. The qualification work must be published in the repository of the Kharkiv National Automobile and Highway University.

5. MATRIX OF CORRESPONDENCE OF SOFTWARE COMPETENCES TO THE COMPONENTS OF THE EDUCATIONAL PROGRAM

Program competencies	Mandatory components of the educational program																																	
	RC 1	RC 2	RC 3	RC 4	RC 5	RC 6	RC 7	RC 8	RC 9	RC 10	RC 11	RC 12	RC 13	RC 14	RC 15	RC 16	RC 17	RC 18	RC 19	RC 20	RC 21	RC 22	RC 23	RC 24	RC 25	RC 26	RC 27	RC 28	RC 29	RC 30	RC 31	RC 32	RC 33	RC 34	RC 35	RC 36
CG1				+		+	+								+																					
CG2												+	+		+						+			+											+
CG3											+				+			+										+								+
CG4														+		+			+				+	+		+			+		+		+		+	
CG5			+					+																								+				+
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SC10				+	+			+						+		+			+				+													
SC11											+		+	+			+		+							+			+						+	+
SC12																	+				+		+	+	+	+		+	+	+	+				+	+

6. MATRIX OF ENSURING PROGRAM LEARNING OUTCOMES BY EDUCATIONAL PROGRAM COMPONENTS

Soft-ware the results	Mandatory components of the educational program																																		
	RC 1	RC 2	RC 3	RC 4	RC 5	RC 6	RC 7	RC 8	RC 9	RC 10	RC 11	RC 12	RC 13	RC 14	RC 15	RC 16	RC 17	RC 18	RC 19	RC 20	RC 21	RC 22	RC 23	RC 24	RC 25	RC 26	RC 27	RC 28	RC 29	RC 30	RC 31	RC 32	RC 33	RC 34	RC 35	RC 36
PLO1						+					+			+					+			+													+
PLO2									+					+		+					+		+													
PLO 3						+					+		+					+	+			+					+									
PLO 4											+			+				+				+												+		+
PLO 5							+										+			+		+											+			+
PLO 6						+					+		+		+				+	+		+		+												+
PLO 7					+		+			+			+					+		+					+	+	+		+			+				+
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PLO 14																										+	+	+	+	+	+	+			+	+
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7. MATRIX OF CORRELATION BETWEEN PROGRAM LEARNING OUTCOMES (PLO) AND PROGRAM COMPETENCES

Software the results	In-te-ral	General competences																Professional competences											
		CG1	CG2	CG3	CG4	CG5	CG6	CG7	CG8	CG9	CG10	CG11	CG12	CG13	CG14	CG15	CG16	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12
PLO1	+	+	+	+	+		+	+						+				+	+			+	+	+			+	+	
PLO2	+		+				+	+						+				+									+	+	
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	+																			+	+				+	+		+	+