

ERASMUS MUNDUS DESIGN MEASURES

National Aviation University

Vilnius Gediminas Technical University

University of Žilina



EDUCATIONAL AND SCIENTIFIC PROGRAM "Sustainable Transport Engineering"

Second (master's) level of higher education

PREFACE

Developed by the working group of the educational and professional program consists of:

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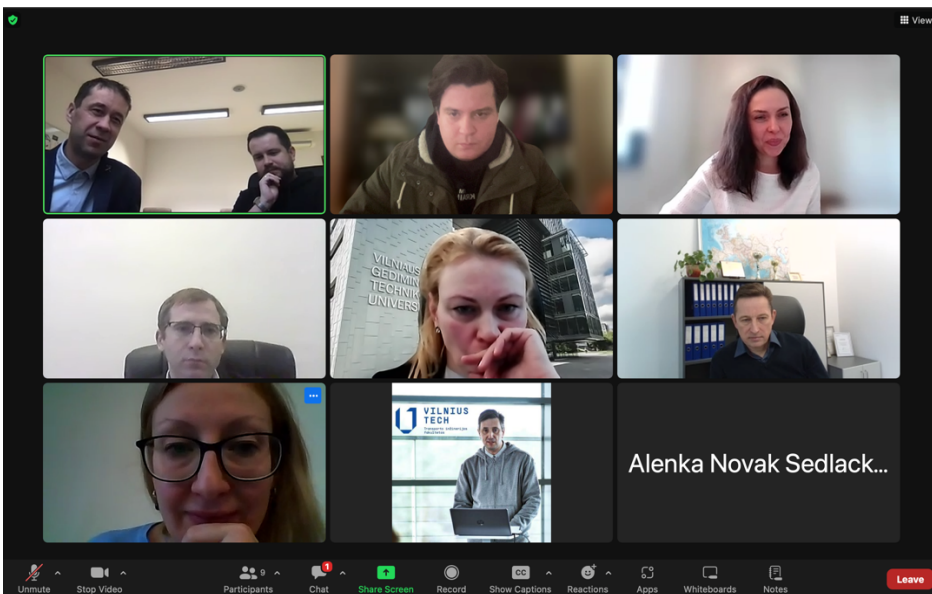
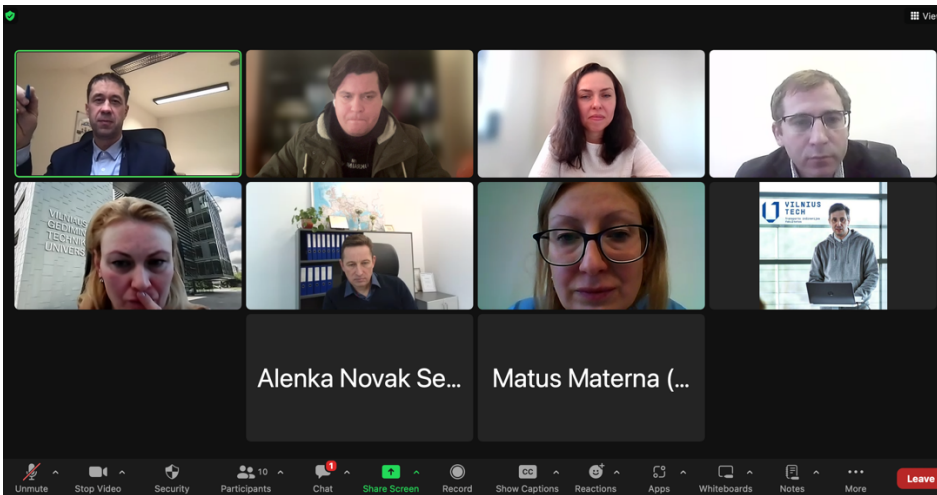
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Highlighting the significance of adhering to GDPR regulations (<https://gdpr-info.eu/>) throughout the project execution to minimize the threats of unauthorized access to "sensitive" personal information due to report publication on the project website, it's crucial to note that the document lacks participant signatures.

It's worth mentioning that due to the military aggression from the Russian Federation, conducting the final workshop in Kyiv for signing pertinent documents became unfeasible. Instead, a conclusive online meeting was organized with all project participants, with screenshots providing confirmation of project outcomes endorsement.



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1. Profile of the Educational and Scientific program

Section 1. General information		
1.1.	The full name of the institution of higher education and structural unit	1. National Aviation University Faculty of Transport, Management, and Logistics Department of air transportation management 2. Vilnius Gediminas Technical University 3. University of Zilina
1.2.	Degree of higher education and title of qualification in the original language	EL "Master" Master of Transport Technologies (by modes)
1.3.	The official name of the educational and scientific program	Sustainable Transport Engineering Specialty – 275.04 "Transport Technologies (by modes)"
1.4.	Type of diploma and scope of the educational and scientific program	Master's diploma, joint, 120 ECTS credits, study period 2 years (full-time study). Study periods of foreign students are determined by separate orders of the university in accordance with normative documents in the field of higher education
1.5.	Accreditation institution	not accredited
1.6.	Accreditation period	not accredited
1.7.	Cycle/Level	Level 7 of the National Qualifications Framework of Ukraine (NQF of Ukraine), second cycle of the European Higher Education Area (FQ-EHEA), Level 7 of the European Qualifications Framework for Lifelong Learning (EQF-LLL)
1.8.	Prerequisites	Possession of a Bachelor's Degree. International certificate in a foreign language not lower than level B2 of the All-European recommendations on language education. The institution of higher education has the right to recognize and re-enroll ECTS credits obtained under the previous educational program of Master's (Specialist) training in another specialty. The maximum amount of ECTS credits that can be re-enrolled cannot exceed 25% of the total amount of the educational program.
1.9.	The form of study	Full-time
1.10.	Teaching language(s)	English
1.11.	Internet address of the permanent placement of the description of the EDUCATIONAL AND SCIENTIFIC program	http://nau.edu.ua
Chapter 2. The purpose of the educational and scientific program		
2.1.	The purpose of the educational and scientific program is to prepare highly qualified specialists who are able to solve difficult complex tasks and problems of the transport industry in context of ensuring the transport systems and technology’s sustainable development at the national and international levels through the generation of new knowledge and innovative ideas based on the integration and internationalization of education, research and practice, the provision of high-quality educational services.	
Chapter 3. Characteristics of the educational and scientific program		
3.1.	Subject area (Object of activity, theoretical content)	<i>Object of activity:</i> transport systems and technologies (by modes). <i>Theoretical content:</i> sections of science and technology that study and combine connections and regularities in

		sustainable development of transport systems and technologies.
3.2.	Orientation of the educational and scientific program	The educational and scientific program has an applied orientation and is based on general scientific provisions, concepts, results of modern scientific and technical achievements in the field of sustainable transport engineering, necessary for the formation of higher education fundamental knowledge and professional skills in conducting research, development and adoption optimal solutions for ensuring the effective functioning and sustainable of transport systems and technologies, organization of passenger and cargo transportation with the use of modern software and technical means of automation, information, intellectual and computer technologies.
3.3.	The main focus of the educational and scientific program	General higher education and professional training in the field of organization of passenger and cargo transportation (by modes); theoretical and practical training of higher education graduates for professional activities (careers) related to consulting, development of project solutions or conducting research on problems of sustainable development of transport systems and technologies. <i>Keywords:</i> transport, technology, sustainable transport development, passenger transportation, cargo transportation; mixed transportation, transport safety and security, integrated transport systems, optimization, design, modeling
3.4.	Features of the educational and scientific program	The educational and scientific program is developed on the basis of a student-centered approach, which is implemented through the individualization of education. The program is based on well-known scientific and technical results, taking into account the current state of the sustainable transportation and technologies market. A feature of the program is the use of modern concepts, author's developments of teachers, various methods of optimizing transport processes, modern information technologies (PTV Vissim, PTV Visum, PTV Viswalk, CAST Terminal Simulation, CAST Aircraft Simulation, CAST Aircraft Simulation, Aimsun, FlexSim, Goodloading, SCM GLOBE, RStudio, MatLab, Autodesk AutoCAD, Autodesk Infracore, Autodesk Civil 3D, etc.), which contribute to the formation of students of higher education in a clear understanding of the connection between conceptual schemes of scientific and technical research and methodological tools used to increase the efficiency of the functioning and development of transport enterprises. The educational and scientific program covers the professional competencies provided for specialists of this profile by the international standards of EU, particularly, in Sustainable and Smart Mobility. The difference of the program lies in the orientation towards the formation of research competencies in students of higher education of the second master's level in order to solve the actual problems of the functioning

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		<p>and development of sustainable transport engineering. The educational and scientific program involves project activities through the implementation of course projects, the completion of production practices, the preparation of qualification works, the results of which can be patented and implemented in enterprises of the transport industry. The program is taught in English.</p>
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Chapter 4. Suitability of graduates for employment and further education

4.1.	Eligibility for employment	<p>Graduates get the opportunity to be employed as managers, managers (managers), professionals (for positions that do not require the award of a doctor of philosophy or doctor of science degree), whose duties are related to the organization and management of transport, transport-production, transport and warehousing processes, implementation of transport technologies, provision of transport and logistics, operator and forwarding services, design of transport systems, carrying out scientific research and teaching activities in the field of transport systems and technologies.</p> <p>Master in Sustainable Transport Engineering must be prepared for work in accordance with the Classifier of Professions 009:2010.</p>
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4.2.	Further education	<p>The program is aimed at continuing education and obtaining higher qualification levels and scientific degrees, which corresponds to the eighth qualification level of the National Qualifications Framework, with the awarding of the first scientific degree of the third level of higher education – doctor of philosophy; acquisition of additional qualifications in the postgraduate education system.</p>
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Chapter 5. Teaching and assessment

5.1.	Teaching and training (methods, techniques, technologies, tools and equipment)	<p><i>Methods, techniques, and technologies:</i></p> <p>Analytical, numerical and experimental methods of studying the sustainable development of transport systems, methods of long-term, short-term and operational management of transport systems, transport technologies.</p> <p>Problem-oriented learning, which involves formulating and solving a problem during lectures, solving situational problems at seminars, practical classes, laboratory work, researching a problem during the independent work of students of higher education.</p> <p>Practice-oriented training through various types of practices at enterprises, institutions and organizations of various forms of ownership on the basis of contracts on the completion of practice, the organization of which is carried out according to the principle of continuity. Performance of practical and laboratory work in production conditions.</p> <p>Information technologies of education: the work of higher</p>
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		<p>education students in specialized classrooms equipped with multimedia complexes, which provides the possibility of conducting interactive lectures and virtual laboratory work, the use of search methods for acquiring new knowledge, the organization of project work, conducting computerized test quality control of knowledge.</p> <p>Project learning technologies are implemented through the implementation of course projects and master's qualification work.</p> <p><i>Tools and equipment:</i> computer and software, multimedia tools; modern devices for controlling transportation and managing the operation of transport systems; full-scale samples and models of transport facilities; materials, hardware and software complexes, control equipment, professional packages of application programs: PTV Vissim, PTV Visum, PTV Viswalk, CAST Terminal Simulation, CAST Aircraft Simulation, CAST Aircraft Simulation, Aimsun, FlexSim, Goodloading, SCM GLOBE, RStudio, MatLab, Autodesk AutoCAD, Autodesk Infracore, Autodesk Civil 3D, etc.</p>
5.2.	Assessment	<p>Knowledge testing, oral scientific presentations using multimedia technology, control and individual works, current control, defense of coursework (projects), practical reports, semester tests and exams, final attestation in the form of defense of the qualification work.</p>
Chapter 6. Program Competencies		
6.1.	Integrated competence (IC)	<p>The ability of a person to solve complex tasks and problems in the field of sustainable transport engineering, which involves conducting research and implementing innovations in transport industry.</p>
6.2.	General competence (GC)	<p>GC 01. Ability to work in an international context.</p> <p>GC 02. The ability to motivate people and move towards a common goal.</p> <p>GC 03. Ability to search, process and analyze information from various sources.</p> <p>GC 04. Ability to communicate with representatives of other professional groups of different levels (experts from other fields of knowledge/types of economic activity)</p> <p>GC 05. Ability to develop projects and manage them.</p> <p>GC 06. The ability to evaluate and ensure the quality of performed works.</p> <p>GC 07 Ability to conduct research at an appropriate level.</p> <p>GC 08. The ability to generate new ideas (creativity).</p>
6.3.	Professional competences (PC)	<p>PC 01. The ability to research and manage the functioning of transport systems and technology.</p> <p>PC 02. The ability to identify and apply promising directions for modeling transport processes in context of sustainable transport engineering.</p> <p>PC 03. Ability to use modern technologies of transport and forwarding activities.</p> <p>PC 04. Ability to manage supply chains and logistics centers in context of European integration processes.</p>

		<p>PC 05. Ability to manage freight transportation by types of transport.</p> <p>PC 06. Ability to manage passenger transportation by types of transport.</p> <p>PC 07. Ability to manage traffic flows.</p> <p>PC 08. The ability to manage the reliability and efficiency of transport systems and technologies.</p> <p>PC 09. Ability to carry out examination of transport accidents by types of transport.</p> <p>PC 10. The ability to take into account the influence of customs procedures in the formation of transport technologies.</p> <p>PC 11. The ability to use specialized software to solve complex problems in the field of transport systems and technologies in context of sustainable transport engineering</p> <p>PC 12. The ability to use knowledge of the regulatory framework that determines the functioning of the transport industry, the laws and principles of functioning of complex systems in combination with the necessary mathematical tools to describe the functioning and development of sustainable transport systems and technologies.</p> <p>PC 13. The ability to formulate and analyze technological, technical, economic and financial problems in transport, which can be related to both commercial practice and transport operations.</p> <p>PC 14. The ability to apply modeling and optimization methods to research and increase the efficiency of the functioning of transport systems and their management processes.</p>
Chapter 7. Program learning outcomes		
7.1.	Program learning outcomes	<p>PLO 01. To identify, address and solve problems in the field of sustainable transport engineering, as well as evaluate and ensure the quality of European integration transport processes.</p> <p>PLO 02. To apply mathematical methods, models, computer technologies to solve tasks and problems in the field of sustainable transport engineering.</p> <p>PLO 03. To make effective decisions in the field of transport systems and technologies, taking into account technical, social, economic and legal aspects, generate and compare alternatives, assess the necessary resources and limitations, analyze risks.</p> <p>PLO 04. To ensure the safety of people and the environment during professional activities and implementation of projects in the field of transport systems and technologies.</p> <p>PLO 05. Develop new and improve existing transport systems and technologies, determine development goals, existing limitations, performance criteria and areas of use.</p> <p>PLO 06. Develop and analyze graphic, mathematical and computer models of transport systems and technologies.</p>

		<p>PLO 07. To develop innovative projects in the field of sustainable transport engineering, justify its social, economic, and environmental effectiveness, organize its implementation.</p> <p>PLO 08. To develop cargo and passenger transportation technologies by modes of transport based on research and relevant data.</p> <p>PLO 09. Ability to design supply chains in conditions of uncertainty, synchronize and coordinate business processes, calculate parameters of its functioning and sustainable development.</p> <p>PLO 10. Develop and apply modern technologies of transport and forwarding service.</p> <p>PLO 11. Analyze and evaluate the efficiency of “green” supply chains and logistics centers, calculate relevant indicators.</p> <p>PLO 12. Manage complex technological and production processes of transport systems and technologies, including unpredictable and those that require new strategic approaches.</p> <p>PLO 13. Organize the work of personnel, ensure their professional development and objective evaluation.</p> <p>PLO 14. Use specialized software for the analysis, development and improvement of transport systems and technologies.</p> <p>PLO 15. Analyze recommendations and substantiate the expediency of using modern methods of traffic management of vehicles.</p> <p>PLO 16. Research theoretical and experimental models for assessing the reliability and efficiency of transport technologies.</p> <p>PLO 17. Apply problem-oriented methods of analysis, synthesis and optimization of computer-integrated information systems for managing transport complexes.</p> <p>PLO 18. Present the results of research activities, in particular, prepare publications, participate in discussions at conferences, symposia and other events.</p>
Chapter 8. Resource support for program implementation		
8.1.	Staffing	<p>Full-time scientific and pedagogical workers who are involved in the implementation of the educational component of the EPP, in accordance with the licensing requirements, have a scientific degree and an academic title, are leading specialists in the specialty 275 – Transport technologies (on air transport), and also have the necessary scientific and pedagogical work experience.</p>
8.2.	Material and technical provision	<p>The material and technical base of the university and the graduation department of the organization of air transportation allows to provide training of specialists at the second (Master's) level of higher education under the EPP:</p> <ul style="list-style-type: none"> – provision of computer workplaces and applied computer programs is sufficient for the implementation of educational plans; – all computers of the department are connected to the

		<p>local network of the university with the possibility of access to the global Internet;</p> <ul style="list-style-type: none"> – the department is equipped with sufficient office equipment (printers, MFPs, scanners) to maintain documentation and provide teaching and methodical materials for the educational process; – educational and scientific laboratories are equipped with technical means and specialized software (LINDO, AnyLogic, PTV, Autodesk, etc.).
8.3.	Informational and educational and methodical provision	<p>Provision of educational and teaching-methodical literature, access to specialized periodicals of a professional direction, implementation of an electronic catalog and the possibility of working with electronic textbooks is carried out at the expense of the funds of the Scientific and Technical Library of NAU.</p> <p>Educational and methodological materials of educational disciplines (lecture notes, laboratory practices, etc.), NAU repository (https://er.nau.edu.ua), resources of the scientific and technical library of NAU (http://www.lib.nau.edu.ua), free access to the full-text resources of the Springer publishing house from the local network of the university, as well as fully functional access to the scientometric databases Scopus and Web of Science; for the publication and approbation of the results of scientific research of graduate students - specialized scientific journals of the NAU (http://jrnل.nau.edu.ua), conferences, including international ones, organized or co-organized by the NAU and publications indexed in the Scopus and Web of Science scientometric databases (http://ieee.nau.edu.ua).</p>
Chapter 9. Academic mobility		
9.1.	National credit mobility	It is implemented on the basis of bilateral agreements between the National Aviation University and universities of Ukraine.
9.2.	International credit mobility	Within the framework of the double degree program with universities registered in ERASMUS+ and ERASMUS MUNDUS. It is implemented on the basis of bilateral agreements between the National Aviation University and educational institutions of partner countries.
9.3.	Education of foreign students of higher education	<p>Adequate conditions have been created to ensure the requirements of the educational process for foreign students of higher education.</p> <p>The admission rules for foreigners and stateless persons are regulated by the Rules of Admission to the National Aviation University.</p>

2. List of components of the educational and scientific program and their logical sequence

2.1. List of EP components

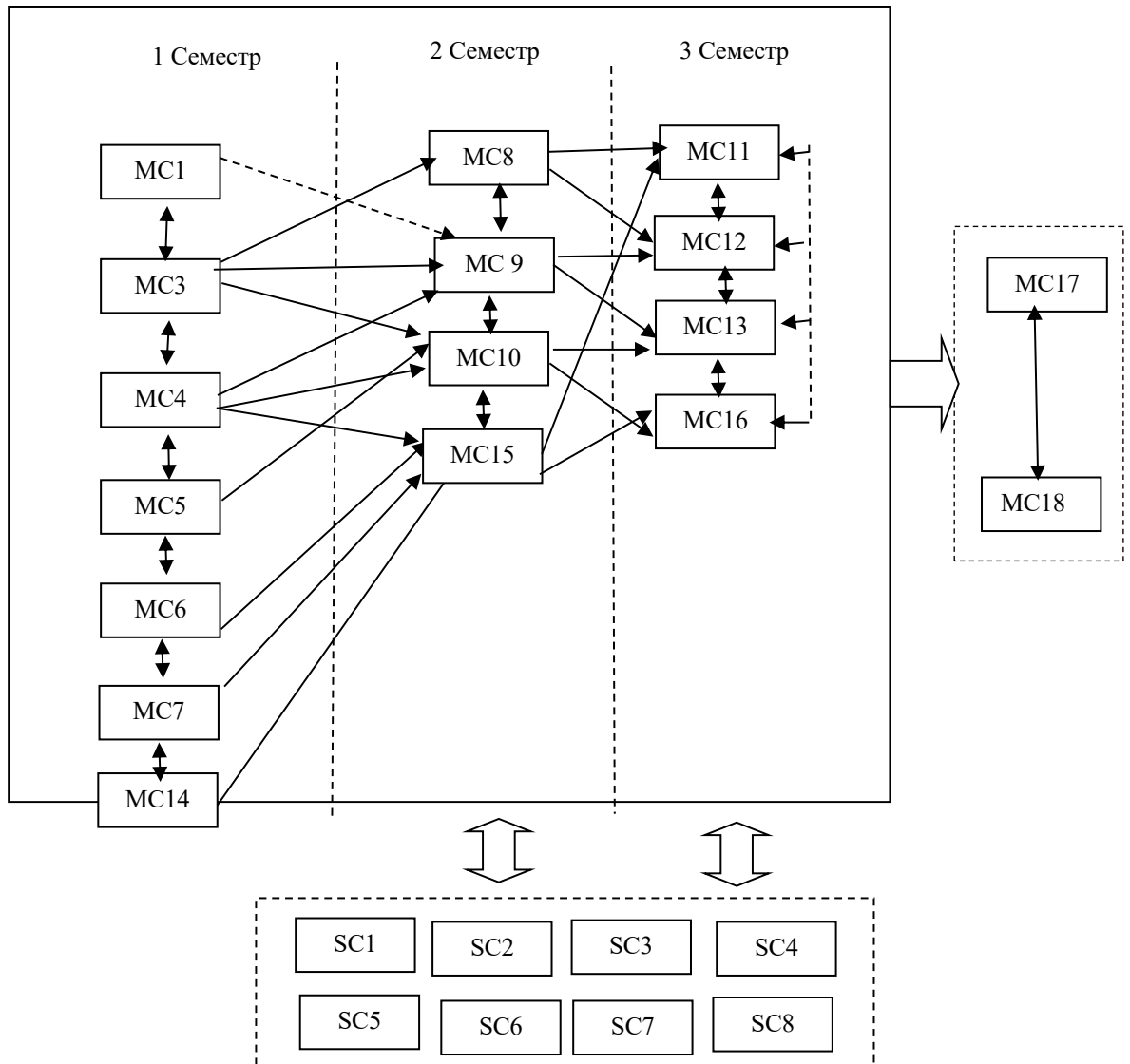
Code of E/D	Components of the educational and scientific program (educational disciplines, course projects (works), practices, qualification work)	Number of Credits	Form of final control	Semester (according to the form of education)
				full-time
Mandatory components				
MC 1	Project Management in Sustainable Transport Engineering	5,0	Examination	1 1
MC 2	Transportation Systems Modeling, Simulation and Analysis	4,0	Examination	1
MC 3	Digitalization and Intelligent Technologies in Sustainable Transport Engineering	4,0	Examination	1
MC 4	Data Analytics in Transport	4,0	Graded Test	1
MC 5	Transport Safety and Security	4,0	Graded Test	1
MC 6	Reliability and Efficiency Management of Transport Systems and Technologies	4,0	Graded Test	1 1
MC 7	Urban Logistics	4,0	Graded Test	1
MC 8	Research Methods in Logistics and Transport	3,5	Examination	2
MC 9	Supply Chain Management in Sustainable Systems	4,5	Examination	2
MC 10	Interoperability of Transport Modes	5,0	Examination	2
MC 11	Communication, Navigation, Surveillance	3,5	Examination	3
MC 12	Economics of Air Navigation Service Providers	4,5	Examination	3
MC 13	Maintenance Procedures	4,5	Graded Test	3
MC 14	Course Project “Project Management in Sustainable Transport Engineering”	1	Defense	1
MC 15	Course Project “Supply Chain Management in Sustainable Systems”	1	Defense	2
MC 16	Course Project “Economics of Air Navigation Service Providers”	1	Defense	3
MC 17	Pre-Diploma Practice	6,0	Graded Test	4
MC 18	Qualification Paper	24,0	Defense	4

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The total volume of mandatory components:		88 ECTS Credits		
Optional components*				
OC 1	Subject 1	4,0	Graded Test	2
OC 2	Subject 2	4,0	Graded Test	2
OC 3	Subject 3	4,0	Graded Test	2
OC 4	Subject 4	4,0	Graded Test	2
OC 5	Subject 5	4,0	Graded Test	3
OC 6	Subject 6	4,0	Graded Test	3
OC 7	Subject 7	4,0	Graded Test	3
OC 8	Subject 8	4,0	Graded Test	3
The total amount of elective components:		24 ECTS Credits		
The total amount of the educational and scientific Program		120 ECTS Credits		

**The realization of the right of higher education seekers to freely choose academic disciplines and create an individual educational trajectory is regulated by the Law of Ukraine "On Higher Education" and internal normative acts of the NAU. Optional components are chosen by students of higher education from the catalogs of the recommended and alternative educational disciplines.*

2.2. Structural and logical scheme of EPP (full-time education)*



**The structural and logical connection between educational components is detailed in the work program for a separate educational component.*

3. Form of attestation of applicants of higher education

Forms of attestation of higher education applicants	Attestation is carried out in the form of a public defense of the qualification paper
Requirements for the qualification work	The qualification paper should provide for the solution of a complex task or problem in the field of transport technologies, which involves conducting research and/or implementing innovations and is characterized by the uncertainty of conditions and requirements. The qualification work should not contain academic plagiarism, fabrication, or falsification. The qualification work must be published on the official website of the institution of higher education or its division, or in the repository of the institution of higher education.

4. Matrix of correspondence of program competences to the components of the educational and scientific program

Competences	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17	MC 18
	Competences																	
IC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GC1	x				x	x	x						x	x		x	x	x
GC2		x		x	x						x		x			x	x	x
GC3		x	x	x							x		x		x	x	x	x
GC4	x	x		x			x				x		x	x	x	x	x	x
GC5				x				x			x	x	x	x	x	x	x	x
GC6				x	x						x	x	x		x	x	x	x
GC7			x	x					x	x	x	x		x		x		x
GC8				x		x		x	x	x	x		x	x	x		x	x
PC1			x		x	x	x	x				x		x				x
PC2			x						x	x		x	x	x	x		x	x
PC3							x					x	x	x	x		x	x
PC4						x							x		x	x	x	x
PC5					x	x	x	x					x	x	x	x	x	x
PC6					x			x					x	x	x	x	x	x
PC7					x	x	x					x	x	x		x	x	x
PC8					x	x		x				x	x	x	x	x	x	x
PC9							x	x					x	x	x		x	x
PC10						x	x							x	x		x	x
PC11			x						x	x		x	x	x	x		x	x
PC12							x	x				x	x	x	x	x	x	x
PC13				x				x			x	x	x	x	x	x	x	x
PC14			x						x	x		x		x		x		x

