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MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY
Faculty of Transport, Management and Logistics
Air Transportation Management Department

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«24» 06 2021

APPROVED
Vice-Rector for Academic Affairs
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«25» 06 2021

Quality Management System

COURSE TRAINING PROGRAM
on
«Geoinformational Systems on Transport»

Educational Professional Program: «Air Transportation Management»
Field of study: 27 «Transport»
Speciality: 275 «Air Transport Technologies»
Specialization: 275.04 «Air Transport Technologies»

Training Form	Semester	Total (hours/credits ECTS)	Lectures	Practicals	Lab. classes	Self-Study	HW/CGP	TP/CP	Semester Grade
Full-time	6	105/3,5	17	–	34	54	CGP-6s	–	Graded Test 6s

Index: СВ-7-275-1/21-2.1.29

Course Training Program on «Geoinformational Systems on Transport» is developed on the basis of Educational Professional Program «Air Transportation Management», Bachelor Curriculum and Bachelor Extended Curriculum №СВ-7-275-1/21, №ЕСВ-7-275-1/21for Speciality 275 «Air Transport Technologies», Specialization 275.04 «Air Transport Technologies», order №____of_____ and corresponding normative documents.

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Discussed and approved by the Graduate Department for Speciality 275 «Air Transport Technologies», Specialization 275.04 «Air Transport Technologies» and Educational Professional Program «Air Transportation Management» - Air Transportation Management Department, Minutes № 12 «9» 06 2021

Guarantor of Educational Professional Program _____ V. Ivannikova

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INTRODUCTION

Course Training Program on «Geoinformational Systems on Transport» is developed based on the "Methodical guidance for the subject course training program", approved by the order № 249/од, of 29.04.2021 and corresponding normative documents.

1. EXPLANATORY NOTES

1.1. Place, objectives, tasks of the subject.

The subject is an integral part of the theoretical basis of knowledge and skills in training specialists of air transportation area, studying the technological subjects.

The objective of the subject is: providing future professionals with specific knowledge on the application of geographic information systems in the process of planning, forecasting and support of management decisions in the activities of transport enterprises.

The tasks of the subject are:

- study of information technologies related to the collection, storage, processing and use of information;
- study of the basic principles of using geographic information systems and technologies to solve transport problems;
- study of the main tasks and capabilities of geographic information systems;
- study of the principles of contactless identification technologies;
- study of the structure and content of information software packages for route development and cost optimization;
- study of the principles of operation of intelligent transport systems.

1.2. Learning outcomes the subject makes it possible to achieve.

- Formulate, modify, develop new ideas for improving transport technologies;
- Develop, plan, implement methods of organizing safe activities in the field of transport systems and technologies;
- Apply, use modern information and communication technologies to solve practical problems in the organization of transportation and design of transport technologies;
- Develop and use transport technologies taking into account the requirements for environmental protection.

1.3. Competences the subject makes it possible to acquire.

- Ability to analyze and predict the parameters and performance indicators of transport systems and technologies, taking into account the impact of the external environment;
- Ability to use modern information technologies, automated control systems and geographic information systems in the organization of the transportation process;
- Ability to organize international transportation.

1.4. Interdisciplinary connections.

This subject is the basis for studying such subjects, as «Air Passenger Transportation», «Information Systems and Technologies on Transport», and is base for studying following subjects, as: «Microcontrollers and Programming of Automation Means of Transport Processes and Systems», «Aircraft Handling at Airports».

2. COURSE TRAINING PROGRAM ON THE SUBJECT

2.1. The subject content.

Training material is structured according to module principle and consists of **one educational module, Module №1 «Geoinformational Systems on Transport»** that is logically complete, relatively independent, holistic part of the subject, learning of which provides module test and analysis of its performance.

2.2. Modular structuring and integrated requirements for each module.

Module №1 «Geoinformational Systems on Transport»

Integrated requirements to module №1:

As a result of mastering the study material of the training module №1 " **Geoinformational Systems on Transport** " the student must:

know:

- basics of national geospatial data infrastructure;
- general concepts of information and geoinformation systems;
- structure, functions and technologies of geographic information systems;
- information support of geoinformation systems;
- spatial data models;
- software of geographic information systems;
- general information about database management systems;
- areas of application of geographic information systems.

be able:

- determine the coordinates based on the results of code measurements;
- independently search, analyze, structure and select the necessary information in the field of geoinformation technologies in transport;
- independently analyze and optimize traffic flows in the transport system;
- independently analyze the data obtained from the calculation of transport routes using geographic information systems;
- work with modern geographic information systems to solve applied transport problems.

Topic 1. Integration of Ukraine into the world geoinformation space.

Theoretical foundations of the national infrastructure of geospatial data. Purpose, main tasks and principles of creating a national infrastructure of geospatial data. International experience and the state of formation of geospatial data infrastructure in Ukraine. Development of information technologies in the field of geospatial data.

Topic 2. General concepts of information and geoinformation systems.

General concepts of information. Information systems, their classification and components. Components of information systems. The concept of geoinformatics and geographic information systems. The concept of geodata. Problems of geoinformatics. Definition of GIS. GIS components. Difference of GIS from other information systems.

Topic 3. Structure, functions and technologies of geographic information systems.

General definitions. GIS structure. Purpose, tasks and functions of GIS. Geoinformation technologies (GIT). GIS classification. Organization of data in GIS.

Topic 4. Information support of geoinformation systems.

Data sources for GIS. Cartographic sources. Data from remote sensing. Field survey data (geodetic and topographic data). Cadastral data. Statistical data sources. Internet as a data source for GIS. Creating an Internet data source. Text materials as a data source for GIS.

Topic 5. Spatial data models.

Classification of models. Non-topological data model. Topological data model "Coverage". Transport network model. Raster data model. Triangulation model of surfaces. Georelational data model. Geobase.

Topic 6. Geographic information systems software.

GIS market. Full-featured GIS. Raster GIS. Means of processing geodetic data. Vectorizer. General information about database management systems. Prerequisites for the emergence of the concept of databases. Stages of development of database management systems. Structural elements of the database. DBMS functions.

Topic 7. Application of geographic information systems.

Reference GIS. Navigation GIS. Dispatching GIS. GIS and business. GIS and authorities. GIS and urban cadastre. GIS and urban and regional development planning. GIS and engineering networks. GIS and transport. GIS and agriculture. GIS and forestry. GIS and subsoil use. GIS and ecology. GIS and defense. GIS and education.

Topic 8. Vehicle and traffic management.

General classification of information and navigation systems. Multi-mode traffic. Local and global applications of intelligent transport systems. Land transport management. Built-in navigation systems. Routing advisory systems. Principles of using geographic information systems for vehicle traffic monitoring. Tracking and Tracing navigation systems. Satellite navigation. Review of foreign and domestic manufacturers of information and navigation systems.

2.3. Training schedule of the subject.

№	Theme (thematic section)	Total, hours			
		Total	**Lectures**	**Labs**	**Self-study**
1	2	3	4	5	6
Module №1 «Geoinformational Systems on Transport»					
		6 semester			
1.1	Integration of Ukraine into the world geoinformation space	**11**	2	2 2	5
1.2	General concepts of information and geoinformation systems.	**11**	2	2 2	5
1.3	Structure, functions and technologies of geographic information systems	**11**	2	2 2	5
1.4	Information support of geoinformation systems	**11**	2	2 2	5
1.5	Spatial data models	**11**	2	2 2	5
1.6	Geographic information systems software	**11**	2	2 2	5
1.7	Application of geographic information systems.	**11**	2	2 2	5
1.8	Vehicles and traffic management	**12**	2 1	2 2	5
1.9	Calculation and Graphic Paper	**10**	-	-	10
1.10	Module Test №1	**6**	-	2	4
Total by the module №1		**105**	**17**	**34**	**54**
Total by the subject		**105**	**17**	**34**	**54**

2.4. Calculation and Graphic Paper.

Calculation and Graphic Paper (CGP) in the discipline is performed in the sixth semester, in accordance with the approved guidelines, in order to consolidate and deepen the theoretical knowledge and skills acquired by students in the process of mastering educational material on the use of geographic information systems in transport.

CGP is performed on the basis of educational material submitted for independent study by students, and is part of the module №1 "Geoinformation systems in transport".

The specific purpose of the CGP is, depending on the variant of the task, in the study and assimilation of real-world objects, determination of spatial characteristics and temporal characteristics, determination of relevance and irrelevance of data. For successful implementation of RGR the student should know: introduction of necessary conditions for creation of the program project in GIS taking into account requirements of the customer for GIS of various function; development of algorithms and techniques for the optimal solution of the problem; be able to: develop programs necessary for a specific GIS project; use a programming language to implement the project.

Execution, registration and protection of CGP is carried out by the student individually according to methodical recommendations.

Time, necessary to perform the CGP, – is up to 10 hours of individual work.

3. BASIC CONSEPTS OF GUIDANCE ON THE SUBJECT

3.1. Teaching methods

The following teaching methods of subject guidance are

–- explanatory and illustrative method;

–- method of problem presentation;

–- reproductive method;

–- research method.

The implementation of these methods are carried out during lectures, demonstrations, self-study, work with the educational material, analysis of transport technologies issues.

3.2. List of references (basic and additional)

Basic literature

3.2.1. Доля К.В., Доля О.Є. Геоінформаційні системи на транспорті. – Харків: ХНУМГ ім. О.М. Бекетова, 2018.

3.2.2. В.І. Зацерковний. Геоінформаційні системи в науках про Землю / В.І. Зацерковний, І.В. Тішаєв, І.В. Віршило, В.К. Демидов – Ніжин: НДУ ім. М. Гоголя, 2016. – 510 с.

3.2.3. Геоінформаційні системи і бази даних: монографія. – Кн. 2 / В. І. Зацерковний, В. Г. Бурачек, О. О. Железняк, А. О. Терещенко. – Ніжин: НДУ ім. М. Гоголя, 2017. – 237 с.

3.2.4. Творошенко І. С. Конспект лекцій з дисципліни «Інтелектуальні геоінформаційні системи» / І. С. Творошенко; Харків. нац. ун-т міськ. госп-ва ім. О. М. Бекетова. - Харків: ХНУМГ ім. О. М. Бекетова, 2016. - 95 с.

Additional Literature

3.2.5. Кейк Д., Лященко А.А., Путренко В.В. Системи керування базами геоданих для інфраструктури просторових даних. Навчальний посібник. Київ: Планета-прінт, 2017. 456 с.

3.2.6. Шевчук В.В., Іванік О.М., Крочак М.Д., Мєнасова А.Ш. Загальна «Геоінформаційні системи та технології». Практикум. – К.: ВПЦ „Київський університет”, 2016. – 136 с.

3.2.7. Магваїр Б., Пашинська Н.М, Даценко Л.М. Говоров М., Путренко В.В. Геоінформаційні технології та інфраструктура просторових даних: у шести томах. Том І: Вступ до геоінформаційних систем для інфраструктури просторових даних. Навчальний посібник. - Київ: Планета-прінт, 2016. - 396 с.

3.3. Internet Information resource

3.3.1 http://www.gis.org.ua/

3.3.2. http://www.gis.org.ua/download/gis6_doc1.pdf

3.3.3. http://www.gis.org.ua/download/gis6_doc2.pdf

3.3.4. http://www.gis.org.ua/download/gis6_doc3.pdf

3.3.5. http://er.nau.edu.ua/handle/NAU/28039

4. RATING SYSTEM OF KNOWLEDGE AND SKILLS ASSESSMENT

4.1. Assessment of certain kinds of student academic work is carried out in accordance with table 4.1.

Table 4.1

Kind of Academic Work	**Maximum Grade Values**
6-semester	
Module №1 «Geoinformational Systems on Transport»	
Kind of Academic Work	points
Carrying out Labs (8б x 8)	64 (total)
Completion and Defense of Calculation and Graphic Paper	16

For admission to complete module test №1, a student must receive not less than	*48 points*
Module test №1	20
Total by the module №1	**100**
Total by the subject	**100**

The credit rating is determined (in points and in a National Scale) based on the results of all types of academic work during the semester**.**

4.2. Completed types of educational work are credited to the student, if he received a positive rating for them.

4.3. The sum of rating assessments received by the student for certain types of completed academic work is the current modular rating assessment, which is recorded in the module control.

4.4. The final modular rating obtained by the student based on the results of the course defense and defense in points, on the national scale and ECTS scale is entered in the module control, as well as in the study card, individual student curriculum and Diploma Supplement, for example, as follows: ***92 / Excellent / A, 87 / Good / B, 79 / Good / C, 68 / Sat./D, 65 / Sat./E, etc.***

4.5. The Total Grade for the subject is equal to the average grade from Total Semester Grades with its further transformation into national scale and ECTS system.

The Total Grade is recorded to the Diploma Appendix

(Ф 03.02 – 01)

АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

№ прим.	Куди передано (підрозділ)	Дата видачі	П.І.Б. отримувача	Підпис отримувача	Примітки

(Ф 03.02 – 02)

АРКУШ ОЗНАЙОМЛЕННЯ З ДОКУМЕНТОМ

№ пор.	Прізвище, ім’я, по батькові	Підпис ознайомленої особи	Дата ознайом-лення	Примітки

(Ф 03.02 – 04)

АРКУШ РЕЄСТРАЦІЇ РЕВІЗІЇ

№ пор.	Прізвище, ім’я, по батькові	Дата ревізії	Підпис	Висновок щодо адекватності

(Ф 03.02 – 03)

АРКУШ ОБЛІКУ ЗМІН

№ зміни	№ листа (сторінки)				Підпис особи, яка внесла зміну	Дата внесення зміни	Дата введен-ня зміни
	Зміненого	Заміненого	Нового	Анульо-ваного			

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УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				