

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY

Faculty of Architecture, Civil Engineering and Design
Computer Technologies of Airport Construction and Reconstruction Department

AGREED

Dean of the Faculty

 Viktor KARPOV

« 28 » 10 2022

APPROVED

Vice Rector for Academics

 Anatolii POLUKHIN

« 31 » 10



Quality Management System

COURSE TRAINING PROGRAM
on
"Airport Buildings and Structures"

Educational-Professional Program: «Industrial and Civil Engineering»


Field of study: 19 «Architecture and Construction»

Specialty: 192 «Building and Civil Engineering»

Form of training	Sem.	Total (hours/ ECTS credits))	Lec.	Prac.	Lab.	Self-study	Homeworks control works	CP/ TP	Form of control
Full-time	5	120/4	34	17	-	69	-	-	Graded Test 5 st semester
Part-time	-	-	-	-	-	-	-	-	-

Index: CB-5-192-1/21-3.6

QMS NAU CTP 10.01.04-01-2022

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The Course Training Program on “Airport Buildings and Structures” is developed on the basis of the Educational-Professional Program “Industrial and Civil Engineering”, Bachelor Curriculum and Extended Curriculum № CB-5-192-1/21, № ECB-5-192-1/21 for training higher education seekers of the Bachelor degree of specialty 192 "Building and Civil Engineering" and corresponding normative documents.

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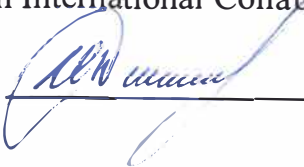
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«28» 10 2022

Level of document – 3b


Planned term between revisions – 1 year

Master copy



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INTRODUCTION

The Course Training Program of the academic discipline "Airport Buildings and Structures" was developed on the basis of the "Methodological recommendations for the development and execution of the syllabus of educational discipline of full-time and part-time forms of training", approved by rector's order No.249/roz. of 29.04.2021 and relevant regulatory documents.

1. EXPLANATORY NOTE

1.1. Role, goal and objectives of the academic discipline.

The role of the discipline is the theoretical and practical basis of the set of knowledge and skills that form the profile of a specialist in the field of airport construction.

The goal of the academic discipline is to prepare civil engineers, which connect their professional life with aviation, for design and construction tasks decision, connected with airport structures construction and reconstruction.

The objectives of the academic discipline are:

- Show close connection of airports construction with climatic characteristics of the places of their geographical location,
- Teach students to perform calculations from construction physics, directed to provision comfort conditions for passengers and airport personnel,
- Consider airport as unique complex of structures, connected with transportations organization as well as aircraft, machinery and airport structures maintenance,
- Show wide possibilities of modern progressive building constructions application in airport structures construction.


1.2. Educational outcomes of the academic discipline.

EO09. Design constructions, buildings, structures, engineering networks and technological processes of construction production, taking into account engineering and technical and resource-saving measures, legal, social, ecological, technical and economic indicators, scientific and ethical aspects, and modern requirements of regulatory documentation, time and other restrictions, in the field of architecture and construction, environmental protection and labor protection.

EO12. Have in-depth cognitive and practical skills, mastery and innovation at the level necessary for solving complex specialized tasks in the field of building and civil engineering (according to the specialization).

1.3. Competencies obtained through the academic discipline.

GC03. The ability to design constructions, buildings, structures and engineering networks (according to specialization), taking into account engineering and technical and resource-saving measures, legal, social, ecological, technical and economic indicators, scientific and ethical aspects, and modern requirements of regulatory

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documentation in the field of architecture and construction, environmental protection and labor protection.

1.4. Interdisciplinary links.

This discipline is based on knowledge of such disciplines as «Structural Mechanics», «Civil Engineering Materials», and is the basis for studying the following disciplines: «Constructions of Buildings and Structures», «Fundamentals of Computer Modeling», «Reinforced Concrete and Stone Structures».

2. PROGRAM OF THE ACADEMIC DISCIPLINE.

2.1. Content of the academic discipline

The educational material of the discipline is structured on a modular basis and consists of one educational module, namely:

educational module 1 "Airport Buildings and Structures", which is a logically complete, relatively independent, integral part of the curriculum, mastering of which involves a module test and results analysis.

2.2. Module structure and integrated requirements for each module

Module №1 «Airport Buildings and Structures»


Integrated requirements for module 1:

To know:

- aircraft classification;
- ICAO airfield classification;
- types of taxiways;
- characteristics and purpose of drainage,
- types of airfield pavements and methods of analysis and load-bearing capacity evaluation according to the state and international norms;
- types of airfield rigid and flexible pavement distresses;
- types of airfield pavement,
- airport structure and requirements to the airport master;
- air passenger terminal design principles;
- air passenger terminal concepts;
- the state and international standards for air passenger terminal design;
- levels of service at air passenger terminal and its functional zones;
- air freight terminal design principles.

Be able to:

- determine runway length for design aircraft,
- perform calculation of airfield flexible pavement;
- perform calculation of airfield rigid pavement;
- determine pavement classification number PCN,
- develop drawings of airport technological process drawings,
- analyze main air passenger terminal concepts;

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- calculate passenger and baggage check-in areas;
- perform calculation of baggage handling systems;
- perform calculation of air freight terminal technological processes.

Topic 1. Airfield elements.

Terms and definitions: airfield, runway, shoulder and threshold, taxiway, apron. ICAO airfield classification. Runway location and orientation. Taxiway system. Types of taxiways. Aircraft classification.

Topic 2. Airport aprons. Holding bays.

Purpose and location of holding bays. Apron area design. Types of aircraft parking. Service vehicle roads.

Topic 3. The drainage system.

Basic information required. Drainage layout. Characteristics and purpose of airport drainage. Drainage system design. Surface drainage. Subsurface drainage

Topic 4. Airport pavements.

Function and purposes of airport pavements. Pavement courses. Pavement types. Classification of aircraft main landing gears. Subgrade strength. Subgrade ratio.

Topic 5. Flexible pavement design.

Types of flexible pavements. Information needed for pavement design. Flexible pavement design by using the state norms. Flexible pavement design by using program FAARFIELD.

Topic 6. Rigid pavement design.


Concrete pavement. Jointed plain concrete pavement. Jointed reinforced concrete pavement. Continuously reinforced concrete pavement. Precast reinforced concrete pavement. Jointing of concrete pavements. Rigid pavement design by using the state norms. Rigid pavement design by using FAARFIELD.

Topic 7. ICAO method of reporting airport pavement strength.

Development of the standardized method ICAO ACN-PCN. Determination of the aircraft classification number ACN. Subgrade category. Determination of the pavement classification number PCN. Method of reporting the pavement classification number PCN. Determination procedures of the numerical PCN value.

Topic 8. Pavement distresses. Airfield pavement overlays.

Types of pavement distress. Rigid pavement distresses. Flexible pavement distresses. Airfield pavement overlays design. The appearance of reflected cracks. Construction of reinforcement of cement concrete pavement with a layer of asphalt

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concrete. Nets made of high-strength polyester, polyethylene, polyester and polypropylene.

Topic 9. Airport.

History of airports development. Perspectives of airports development. Airports structure. The largest airports. Airport classification. Airport certification. Airport structure. Functions of airport. Notion about airport master plan. Ten step sequence of airport master plan developing. Airport key planning items. Requirements to airport master plan. Airport master plan classification. Economical efficiency of airport master plan variant.

Topic 10. Air passenger terminal design principles.

Functional planning of the air passenger terminal. Requirements for the design of an air passenger terminal. Purpose and classification of air passenger terminals. Zoning of air passenger terminal. Master plan of air passenger terminal.

Topic 11. Air passenger terminal concepts.

Types of air passenger terminal concepts. Pier/finger concept, its advantages and disadvantages. Linear concept, its advantages and disadvantages. Open apron concept, its advantages and disadvantages. Satellite concept, its advantages and disadvantages. Compact module unit terminal concept, its advantages and disadvantages

Topic 12. Air passenger terminal planning standards.

IATA planning standards and recommended practice. Types of level of service. Capacity and level of service assessment. Concept of air passenger terminal planning. Principles of communication between the airport and the aircraft. The general scheme of the formation of passenger flows and baggage flows at airports.

Topic 13. Passenger terminal layout.

Separation of passenger flows at the terminal. Concept of air passenger terminal layout. Airport terminal layout: single level concept, one and half level concept, double level concept, three level concept. Design of departure, arrival lounges and boarding galleries. Planning solutions for departure, arrival and boarding galleries. Calculation of the areas of departure and arrival waiting rooms.

Topic 14. Check-in area design.

Check-in systems classification. Check-in concepts. Types of check-in layout. Check-in equipment. Equipment for passenger and baggage check-in. Check-in layout. Calculation of passenger and baggage check-in counters and desks.

Topic 15. Baggage handling system.

Requirements to the baggage handling system. Core principles of baggage handling system design. Baggage claim unit. Structure of baggage handling system. Design of baggage claim area and airport control systems.



Topic 16. Air freight terminal design principles.

General information about air freight terminals. Air freight terminal functions and operations. Landside and airside design. Requirements to air freight terminal layout. Air freight terminal mechanization. Air freight terminal sizing.

2.3. Thematic plan.


№	Topic	Academic hours							
		Full-time study				Part-time study			
		Total	Lectures	Practicals	Self-study	Total	Lectures	Lab. classes	Practicals
1	2	3	4	5	6	7	8	9	10
Module №1 «Airport Buildings and Structures»									
1.1	Airfield elements	5 semester				-			
		3	2	-	1	-	-	-	-
1.2	Airport aprons. Holding bays	7	2	-	5	-	-	-	-
1.3	Aircraft classification	3	-	2	1	-	-	-	-
1.4	The drainage system	6	2	-	4	-	-	-	-
1.5	Airport pavements	7	2	-	5	-	-	-	-
1.6	Runway design	3	-	2	1	-			
1.7	Flexible pavement design	6	2	-	4	-	-	-	-
1.8	Rigid pavement design	11	2	2	7	-	-	-	-
1.9	ICAO method of reporting airport pavement strength	7	2	2	3	-	-	-	-
1.10	Pavement distresses. Airfield pavement overlays.	7	2	-	5	-	-	-	-
1.11	Airport	6	2	-	4	-	-	-	-
1.12	Air passenger terminal design principles	8	2	2	4	-	-	-	-
1.13	Air passenger terminal concepts	5	2	-	3	-	-	-	-
1.14	Air passenger terminal planning standards	9	2	2	5	-	-	-	-
1.15	Passenger terminal layout	5	2	-	3	-	-	-	-
1.16	Check-in area design	8	2	2	4	-	-	-	-
1.17	Baggage handling system	8	2	2	4	-	-	-	-
1.18	Air freight terminal design principles	7	2	1	4	-	-	-	-
1.19	Module Test №1	4	2	-	2	-	-	-	-
Total for Module №1		120	34	17	69	-	-	-	-
Total For Academic Discipline		120	34	17	69	-	-	-	-

3. TRAINING MATERIALS FOR THE DISCIPLINE

3.1. Teaching methods

When studying the discipline, the following teaching methods are used:

- explanatory-illustrative method;
- method of problem statement;
- reproductive method.

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The implementation of these methods is carried out during lectures, demonstrations, independent work, work with educational literature about airports.

3.2. Recommended literature

Basic literature

3.2.1. ДСТУ Б В.2.6-135:2010. Плити залізобетонні попередньо напружені ПАГ для аеродромного покриття. Технічні умови (ГОСТ 25912.0–91, MOD).

3.2.2. ДСТУ Б В.2.6-136:2010. Плити залізобетонні попередньо напружені ПАГ-14 для аеродромного покриття. Конструкція (ГОСТ 25912.1–91, MOD).

3.2.3. ДСТУ Б В.2.6-137:2010. Плити залізобетонні попередньо напружені ПАГ-18 для аеродромного покриття. Конструкція (ГОСТ 25912.2–91, MOD).

3.2.4. ДСТУ Б В.2.6-138:2010. Плити залізобетонні попередньо напружені ПАГ-20 для аеродромного покриття. Конструкція (ГОСТ 25912.3–91, MOD).

3.2.5. Інженерні основи аеропортобудування: навч. посібник / О. І. Лапенко, О. В. Родченко, С. М. Скребнева [та ін.] – К. : НАУ, 2017. – 316 с.

3.2.6. Advisory Circular 150/5320-6G. Airport Pavement Design and Evaluation, US Department of Transportation, Federal Aviation Administration, 2021. USA Standard. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5320-6G-Pavement-Design.pdf

3.2.7. AC 150/5335-5D. *Standardized Method of Reporting Airport Pavement Strength – PCR*. US Department of Transportation, Federal Aviation Administration, 2022. USA Standard. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5335-5D-pavement-strength.pdf

3.2.8. ICAO. Annex 14. Aerodromes. Volume I. Aerodrome Design and Operations. Eighth Edition, July, 2018. – 354 p.

3.2.9. ICAO. Doc 9157. Aerodrome Design Manual. Part I – Runways. Fourth Edition, 2020. – 98 p.

3.2.10. Kaya, O., Ceylan, H., Kim, S., Rezaei-Tarahomi, A. (2022). Evaluation of the Federal Aviation Administration's Rigid Airfield Pavement Cracking Failure Models. *Journal of Transportation Engineering, Part B: Pavements*, 148(1). <https://doi.org/10.1061/JPEODX.0000335>

Additional literature

3.2.11. Rodchenko O.V. Engineering fundamentals of airports construction: lecture course / O.V. Rodchenko, V.Yu. Gyrych. – К. : NAU, 2012. – 108 p.

3.2.12. Ashford, Norman Airport engineering : planning, design, and development of 21st century airports / Norman J. Ashford, Saleh Mumayiz, Paul H. Wright. – 4th ed. – New Jersey: John Wiley and Sons, Inc, 2011. – 796 p.

3.2.13. Проектування аеропортів: підручник / М. Ф. Дмитриченко, М. М. Дмитрієв, М. О. Папченко [та ін.] – К. : НТУ, 2010. – 248 с.

3.3. Internet information resources

3.3.1. <https://avia.gov.ua>

3.3.2. <https://www.antonov.com>

3.3.3. <https://www.airbus.com/aircraft/support-services/airport-operations-and-technical-data/aircraft-characteristics.html>

3.3.4. http://www.boeing.com/commercial/airports/plan_manuals.page

3.3.5. <https://embraer.com/global/en>

3.3.6. <https://www.un.org/ru/ecosoc/icao/>

3.3.7. https://www.icao.int/about-icao/Pages/RU/default_RU.aspx

3.3.8. https://www.faa.gov/airports/engineering/design_software/

3.3.9. <https://kbp.aero/airport/about/>

4. RATING SYSTEM OF KNOWLEDGE AND SKILLS ASSESSMENT

4.1. Evaluation of certain types of work done by students of the points made in accordance with Tables.4.1.

Table 4.1

Kind of Academic Activities	Maximum Grade	
	Full-time study	Part-time study
	5 semester	-
Module №1 «Airport Buildings and Structures»		
Practicals	70	-
<i>For carrying out a module test a student must receive not less than</i>	42	-
Підсумкова семестрова контрольна робота	-	-
Carrying out a module test №1	30	-
Total for module 1	100	-
Total for academic discipline	100	

A **Semester Grade** is determined (in points and in the National Scale) as a result of performing all kinds of educational work during the semester.

4.2. A student is considered to have passed the module if both his/her Current Module Grade and Module Test Grade are positive.

4.3. The Semester Module Grade is calculated as the sum of the Total Module Grades.

4.4. The Semester Module Grade and the Graded Test together make up a Total Semester Grade which is calculated according to the National Scale and the ECTS Scale.

4.5. The Total Semester Grade in points, the National Scale and the ECTS Scale is written into a student's record book, for example: **92/Ex/A**, **87/Good/B**, **79/Good/C**, **68/Sat/D**, **65/Sat/E**, etc.

4.6. The Total Semester Grade of the subject is determined as the arithmetic average grade of the total semester grades in points (for the fourth semester for this subject) with its further transfer into the National Scale and ECTS Scale. The indicated Total Semester Grade of the subject is entered in the Diploma Supplement.



(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 ознайомлення	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 введення зміни
	Зміненого	Заміненого	Нового	Анульованого			

(Ф 03.02 – 32)


УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				



**Syllabus of the academic discipline
«AIRPORT BUILDINGS AND STRUCTURES»
Educational and professional program:
«Industrial and Civil Engineering»,
Field of study: 19 «Architecture and Construction»
Specialty: 192 «Building and Civil Engineering»**

Level of higher education	First (Bachelor)
Discipline status	Academic discipline of the selective component
Course	3
Semester	5
ECTS credits / hours	4,0 / 120
Language of training	English
What will be studied (subject of study)	Airfield elements, airport.
Why is it interesting / necessary to study (goal)	The goal of the academic discipline is to prepare civil engineers, which connect their professional life with aviation, for design and construction tasks decision, connected with airport structures construction and reconstruction.
Why can you learn (learning outcomes)	Be able to determine runway length for design aircraft, perform calculation of airfield flexible pavement; perform calculation of airfield rigid pavement; determine pavement classification number PCN, develop drawings of airport technological process drawings, analyze main air passenger terminal concepts; calculate passenger and baggage check-in areas; perform calculation of baggage handling systems; perform calculation of air freight terminal technological processes.
How to use the acquired knowledge and skills (competencies)	The acquired knowledge and skills are the basis for studying the following disciplines: «Constructions of Buildings and Structures», «Fundamentals of Computer Modeling», «Reinforced Concrete and Stone Structures».
Educational logistics	<p>Contents: ICAO airfield classification. Runway location and orientation. Taxiway system. Aircraft classification. Function and purposes of airport pavements. Pavement types. Pavement design. Rigid and flexible pavement design by using FAARFIELD. The standardized method ICAO ACN-PCN. Airports structure. The largest airports. Airport classification. Airport certification. Airport structure. Functions of airport. Ten step sequence of airport master plan developing. IATA planning standards and recommended practice. Types of level of service. Capacity and level of service assessment. Concept of air passenger terminal planning. Requirements to the baggage handling system. Core principles of baggage handling system design. General information about air freight terminals. Air freight terminal functions and operations.</p> <p>Classroom sessions: lectures, practicals. Teaching methods: problem lectures, online. Form of training: full-part</p>
Prerequisites	Knowledge of civil engineering materials and mechanics of materials.

Porekvizyty	«Constructions of Buildings and Structures», «Fundamentals of Computer Modeling», «Reinforced Concrete and Stone Structures»	
Information support from the repository and fund of NTB NAU	<p>1. Інженерні основи аеропортобудування : навч. посібник / О. І. Лапенко, О. В. Родченко, С. М. Скрєбнєва [та ін.] – К. : НАУ, 2017. – 316 с.</p> <p>2. Проектування аеропортів : підручник / М. Ф. Дмитриченко, М. М. Дмитрієв, М. О. Папченко [та ін.] – К. : НТУ, 2010. – 248 с.</p> <p>3. Rodchenko O.V. Engineering fundamentals of airports construction: lectures course / O.V. Rodchenko, V.Yu. Gyrych. – K.: NAU, 2012. – 108 p.</p> <p>4. Аэродромные покрытия. Современный взгляд / Кульчицкий В. А., Макагонов В. А., Васильев Н. Б. [и др.] – М. : Физико-математическая литература, 2002. – 528 с.</p>	
Location and logistics	projection equipment	
Semester control, examination methods	tests, module test	
Department	Computer technologies of airport construction and reconstruction	
Faculty	Architecture, civil engineering and design	
Professor		<p>RODCHENKO OLEKSANDR Position: Associate Professor Scientific degree: Candidate of Sciences Academic title: Associate Professor Profile: https://rodchenko-edu.wixsite.com/about tel.: 406-74-25 E-mail: oleksandr.rodchenko@npp.nau.edu.ua Room: 5.510</p>
Originality of academic discipline	Author's course	
Link to discipline	psm4yy3	