NATIONAL UNIVERSITY OF LIFE
AND ENVIRONMENTAL SCIENCES OF UKRAINE
Department of Construction

"**AGREED**"
Dean of Design and Engineering Faculty

_____ Ivan ROGOVSKII

"____"_____2026 y.

"**APPROVED**"
by the Department of Construction,
minutes № of " " 2026 y.
Head of the Department
_____ Ihor YAKOVENKO

"**APPROVED**"
Guarantor of the Educational- Professional Program
G19 «Building and Civil Engineering»

_____ Yevhenii BAKULIN

COURSE TRAINING PROGRAM OF THE ACADEMIC DISCIPLINE

VOLUME - SPATIAL DECISIONS OF BUILDINGS AND STRUCTURES

Field of study G « Engineering, Manufacturing and Construction»

Specialty G19 «Building and Civil Engineering»

Educational-Professional Program: "Building and Civil Engineering"

Orientation of the educational program – Educational- Professional

Faculty of Design and Engineering

Developed by: Associate professor, Cand. of Tech. Sc. (PhD): Yevhenii BAKULIN
(position, academic degree, academic title)

Kyiv – 2026

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Description of the academic discipline

"Volume-spatial decisions of buildings and structures" is an integral part of design and building production during the construction of individual buildings and structures or their aggregates. This course provides for the study and creation of healthy housing, volume and spatial decisions of multi-apartment residential buildings, volume and spatial decisions and engineering support of frame-monolithic multi-storey residential buildings, volume-planning and structural decisions of industrial buildings. The use of zoning of industrial buildings, if possible, within the volume of the building, rational grouping of sections and zones in accordance with certain characteristics (level of industrial hazard, fire and explosion safety, irregularity of transport and human flows).

Field of study, specialty, educational program, educational degree		
Educational degree	*Master*	
Specialty	*G19 «Building and Civil Engineering»*	
Educational program	*Building and Civil Engineering*	
Characteristics of the academic discipline		
Type	mandatory	
The total number of hours	180	
Number of ECTS credits	6	
Number of content modules	4	
Course project (term paper) (if available)	1	
Control form	*test, exam*	
Academic discipline indicators for full-time and part-time forms of higher education		
	Form of obtaining higher education	
	full-time	**part-time**
Course (year of training)	1	
Semester	1,2	
Lectures	*15/30 h.*	
Practical, seminar classes	-	
Laboratory classes	*30/30 h.*	
Independent work	*30/45 h.*	
Number of weekly classroom hours for full-time higher education	*3/4 h.*	

1. Purpose, competencies and program outcomes of the academic discipline

The purpose is to unite and systematize scientific and technical information in the field of design, to prove and form knowledge and skills in the design of buildings and structures and their complexes in accordance with functional requirements, legal laws of Ukraine to ensure reliable and safe use of buildings and structures.

List of academic disciplines that precede the study:

Descriptive geometry and engineering graphics, History and philosophy of construction, Fundamentals of the theory of elasticity and plasticity in construction, Theoretical and structural mechanics, Mechanics of materials and structures, Engineering geodesy, Architecture of buildings and structures, Fundamentals and foundations, Fundamentals of design of agricultural buildings and structures, Water supply, drainage, heat and gas

supply and ventilation, Building structures, Metal structures, Reinforced concrete and stone structures.

Acquisition of competencies:

integrated competence (IC):

The ability to solve research and/or innovative problems in the field of construction and civil engineering with an orientation towards the agro-industrial complex.

General competencies (GC):

GC04. The ability to make informed decisions.

Special (professional) competencies (SC):

SC02. The ability to develop and implement projects in the field of construction and civil engineering.

SC06. The ability to use existing computer programs in construction when solving complex engineering problems in the field of construction and civil engineering.

SC11. Ability to compile and prepare scientific, technical and regulatory documentation, drawings, scientific reports, papers, articles, patents, etc.

SC12. Ability to use a foreign language in a professional field: oral and written communication; search for scientific, regulatory and technical literature; work with software.

SC13. Ability to apply and adhere to the values and principles of academic integrity.

Program learning outcomes (PLO):

PLO1. Design buildings and structures of the agro-industrial complex, including using computer-aided design software systems, in order to ensure their reliability and durability, make rational design and technical decisions, conduct feasibility studies, taking into account the characteristics of the construction object, determine the optimal mode of its operation and implement measures for resource and energy conservation.

PLO6. Apply modern mathematical methods for analyzing statistical data, calculating and optimizing design parameters and technological processes for the construction of buildings and structures.

PLO9. Select modern materials, technologies and methods for implementing the construction production process, taking into account the architectural, planning, constructive part of the project and the base of the construction organization.

PLO11. Adhere to the norms of academic integrity, know the basic legal norms regarding the protection of intellectual property, commercialization of the results of research, invention and design activities.

PLO14. Use modern systems of automated design and BIM modeling during project management, construction of computer models of construction structures, buildings and engineering structures of the agro-industrial complex.

PLO15. Use a foreign language in the professional sphere - work with scientific, regulatory and technical literature; communication in oral and written forms; free user of CAD systems and BIM models.

2. Program and structure of the academic discipline

Names of content modules and topics	Number of hours												
	full-time							part-time					
	Weeks	total	including					total	including				
			l	p	lab	Ind	s.w.		l	p	lab	ind	s.w.
Module №1. ***Volume- spatial and structural decisions of buildings***													
Topic 1. Introduction. Development of the architectural and construction complex of Ukraine	2	8	2		4		2						
Topic 2. Classification of buildings	2	8	2		4		2						
Topic 3. Volume-spatial and structural decisions of buildings	3	12	2		4		6						
Topic 4. Structures of frame elements and roofs of public buildings	2	14	2		4		8						
Total for module 1	42		8		16		18						
Module №2. ***Volume-spatial decisions of transport structures***													
Topic 5. Volume and spatial decisions of transport structures	3	15	3		6		6						
Topic 6. Structural decisions of stairs	3	18	4		8		6						
Total for module 2	33		7		14		12						
Total hours 1 semester	75		15		30		30						
Module №3. ***Spatial reinforced concrete roofs structures***													
Topic 7. Material for spatial structures and their classification	3	10	4		4		2						
Topic 8. Vaults	2	10	4		4		2						
Topic 9. Folds. Variety of architectural and structural solutions of folds in construction	3	10	4		4		2						
Topic 10. Domes. Spatial structure of the dome. Their classification according to the structural scheme.	2	10	4		4		2						
Total for module 3	40		16		16		8						
Module №4. ***Spatial metal and pneumatic constructions of the roofs***													
Topic 11. Metal thin-walled roof structures	2	15	6		6		3						
Topic 12. Cable-supported roofs.	2	10	4		4		2						
Topic 13. Soft shells.	2	10	4		4		2						
Total for module 4	35		14		14		7						
Total hours for 2nd semester	75		30		30		15						

Course project on the design of volume-spatial decisions for buildings and structures						30						
Total hours	180	45		60		75						

3. Lecture topics

№	Topic name	Number of hours
1	Introduction. Development of the architectural and construction complex of Ukraine	2
2	Classification of buildings	2
3	Volume-spatial and structural decisions of buildings	2
4	Designs of frame elements and roofs of public buildings	2
5	Volume and spatial decisions of transport structures	3
6	Structural decisions of stairs	4
7	Material for spatial structures and their classification	4
8	Vaults	4
9	Folds. Variety of architectural and structural decisions of folds in construction	4
10	Dome. Spatial structure of the dome. Their classification according to the structural scheme	4
11	Metal thin-walled roofs structures	6
12	Cable-supported roofs	4
13	Soft shells	4

4. Topics of laboratory (practical, seminar) classes

№	Topic name	Number of hours
1	Volume-planning decisions of an apartment in a multi-storey residential building.	4
2	Design of non-residential premises with compliance with the conditions of their zoning: planning structures and elements of apartments.	4
3	Design of a typical floor of a residential building from volume blocks.	4
4	Volume-planning and structural decisions of an industrial building. Choosing the number of storeys of a building. Selection of the width and height of the spans, column spacing.	4
5	Creating images of two-dimensional objects in the Archicad system, Setting drawing parameters. Creating and editing text. Applying dimensions.	6
6	Creating and editing walls. Contours of external walls. Inserting window and door blocks and their editing. Creating blocks of objects. Inserting blocks.	8
7	Design plans of public buildings.	4
8	Features of constructing design schemes for spatial structures.	4
9	Defining the geometric scheme of a reinforced concrete fold.	4
10	Creating the geometric scheme of a reinforced concrete dome.	4
11	Creating the geometric scheme of a reinforced concrete shell.	6
12	Creation of a geometric scheme of a membrane sheet shell	4
13	Creation of a geometric scheme of a suspended roof	4

5. Topics for independent work

№	Topic name	Number of hours
1	Frames of single-story multi-span industrial buildings	5
2	Beam structures of roofs	5
3	Spatial structures of flat roofs	10
4	Spatial structures of spatial roofs	10
5	Cable structures of roofs	10
6	Types of building glass	5
7	Term paper	30

6. Methods and means of diagnosing learning outcomes:

– oral or written survey;
– interview;
– testing;
– defense of laboratory/practical, computational/graphic works, papers, projects.

7. Teaching methods:

– method of practice-oriented learning;
– method of project-based learning;
– method of flipped classroom, blended learning;
– method of learning through research;
– method of educational discussions and debates;
– method of teamwork, brainstorming.

8. Assessment of learning outcomes.

The assessment of the knowledge of a higher education applicant is carried out on a 100-point scale and is translated into a national assessment in accordance with the current "Regulations on Examinations and Tests at the NULES of Ukraine"

8.1. Distribution of points by types of educational activities

Type of learning activity	Learning outcomes	Assessment
Module №1. ***Volume- spatial and structural decisions of buildings***		
Lecture 1**.** Introduction. Development of the architectural and construction complex of Ukraine	Know the theoretical outline of the lecture	
Laboratory class 1. Volume-planning decisions of an apartment in a multi-storey residential building.	Develop a spatial-planning decision for an apartment in a multi-storey residential building	**18**
Lecture 2. Classification of buildings	Know the theoretical outline of the lecture	**-**
laboratory class 2. Design of non-residential premises with compliance with the conditions of their zoning: planning structures and elements of apartments.	Be able to design residential premises in compliance with the conditions of their zoning: planning structures and elements of apartments	**18**
Lecture 3. Volume-spatial and structural	Know the theoretical outline of the lecture	**-**

decisions of buildings		
Laboratory class 3. Design of a typical floor of a residential building from volume blocks.	Know how to design a typical floor of a residential building made of volume blocks.	**17**
Lecture 4. Structures of frame elements and roofs of public buildings	Know the theoretical outline of the lecture	**-**
Laboratory class 4. Volume-planning and structural decisions of an industrial building.	Design volume-planning and structural decisions of an industrial building. Choosing the number of storeys of a building. Selection of the width and height of the spans, column spacing.	**17**
Modular control work 1.		**30**
Total for module 1		**100**
Module №2. ***Volume-spatial decisions of transport structures***		
Lecture 5. Volume and spatial decisions of transport structures	Know the theoretical outline of the lecture	**-**
Laboratory class 5. Creating images of two-dimensional objects in the Archicad system	Be able to create images of two-dimensional objects in the Archicad system,	**40**
Lecture 6. Structural decisions of stairs	Know the theoretical outline of the lecture	**-**
Laboratory class 6. Creating and editing walls. Contours of external walls. Inserting window and door blocks and their editing. Creating blocks of objects. Inserting blocks	Be able to choose the material and know the calculations of the space-enclosing building structural elements	**30**
Modular control work 2.		**30**
Total for module 2		**100**
Study work		**≤ 70**
Differentiated test		**30**
Total for 1 semester		**≤ 100**
Module №3. ***Spatial reinforced concrete roofs structures***		
Lecture 7. Material for spatial structures and their classification	Know the theoretical outline of the lecture	**-**
Laboratory class 7. Design plans of public buildings.	Be able to choose a volume-spatial decision for a building.	**18**
Lecture 8. Vaults	Know the theoretical outline of the lecture	**-**
Laboratory class 8. Features of constructing design schemes for spatial structures.	Be able to develop the construction of three-dimensional building objects.	**18**
Lecture 9. Folds. Variety of architectural and structural solutions of folds in construction	Know the theoretical outline of the lecture	**-**
Laboratory class 9. Defining the geometric scheme of a reinforced concrete fold.	Be able to set the boundary conditions of the geometric scheme of a reinforced concrete fold.	**17**
Lecture 10. Domes. Spatial structure of the dome. Their classification according to the structural scheme.	Know the theoretical outline of the lecture	**-**
Laboratory class 10. Creating the geometric scheme of a reinforced concrete dome.	Know the features of constructing calculation schemes of spatial structures	**17**

Modular control work 3.		**30**
Total for module 3		**100**
Module №4. ***Spatial metal and pneumatic constructions of the roofs***		
Lecture 11. Metal thin-walled roofs structures.	Know the theoretical outline of the lecture	**-**
Laboratory class 11. Creating the geometric scheme of a reinforced concrete shell.	Creating a geometric scheme of a membrane thin-sheet shell	**24**
Lecture 12. Cable-supported roofs.	Know the theoretical outline of the lecture	**-**
Laboratory class 12. Creation of a geometric scheme of a membrane sheet shell.	Creating a geometric scheme of a cable-supported roofs	**23**
Lecture 13. Soft shells.	Know the theoretical outline of the lecture	**-**
Laboratory class 13. Creation of a geometric scheme of a suspended roof.	Knowledge of the boundary conditions of a structural roof plate	**23**
Модульна контрольна робота 4.		**30**
Total for module 4		**100**
Study work		**≤ 70**
Examination		**30**
Total for course		**≤ 100**
Course project		**100**

8.2. Scale for assessing knowledge of a higher education applicant

Higher education applicant rating, points	National grading system (exams/tests)
90-100	excellent
74-89	good
60-73	satisfactory
0-59	unsatisfactory

8.3. Assessment Policy

Deadlines and Rescheduling Policy	EXAMPLE: Works submitted after the deadline without good reason are evaluated with a lower grade. Re-siting of modules is carried out with the permission of the lecturer if there are good reasons (for example, illness).
Academic Integrity Policy	EXAMPLE: Cheating during tests and exams is prohibited (including using mobile devices). Term papers, essays must have correct text references to the literature used
Attendance Policy	EXAMPLE: Attendance at classes is mandatory. For objective reasons (for example, illness, international internship) training can take place individually (in online form in agreement with the dean of the faculty)

9. Educational and methodological support:

- electronic educational course of the academic discipline (on the educational portal of the NULES of Ukraine eLearn - https://elearn.nubip.edu.ua/course/view.php?id=4236);
- links to digital educational resources;
- textbooks.

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