General information

For ED	Bachelor	
Knowledge area	19 "Architecture and construction"	
Speciality	192 " Building and engineering of the city"	
Specialization	-	
Characteristics of the discipline		
Type	Obligatory	
language of teaching	English	
Total number of hours	150	
Number of credits ECTS	5	
Number of thematic modules	4	
Form of control	*Credit /examination*	
Indicators of the discipline for daily learning		
Year of study (course)	2, 3	
Semester	4	5
Lectures	30 hours.	30 hours.
Practical, seminar classes	30 hours.	30 hours.
Independent study	15 hours.	15 hours.

Teacher

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DESCRIPTION OF COURSE

The educational discipline "Structural Mechanics" is aimed at students' study of the issues of calculation of complex structures for strength, stiffness and stability, without a deep understanding of which it is impossible to fully prepare bachelors for the design of modern rural structures. The course deals with the calculation of composite structures for moving loads.

The purpose of the discipline is the general technical training of a specialist in the branch of construction, as well as the acquisition of skills in Theoretical and Structural Mechanics and the establishment of a base for studying the disciplines: "Metal structures", "Reinforced concrete structures", " Dynamics of bases and foundations".

Prerequisites for studying the course. Studying of the discipline assumes that you have knowledge of mathematics, physics, theoretical mechanics and mechanics of materials and constructions.

Competencies of the educational programme:

Integral competence (IC): IC The ability to solve complex specialized construction and civil engineering tasks in the learning process, which involves the application of a complex of theories and methods for determining the strength, stability, deformability, modeling, strengthening of building structures; further safe operation, reconstruction, construction and installation of buildings and engineering structures; application of automated design systems in the field of construction.

General competencies (GC): GC 01. Ability to learn and master modern knowledge.

Gc 02. Knowledge and understanding of the subject area, professional understanding activities of the construction industry.

Gc 6. Ability to apply knowledge in practical situations.

Gc 7. Ability to evaluate and ensure the quality of work performed.

Professional (special) competencies (PC):

Discipline provides a number of competencies

PC1. Ability to use conceptual scientific and practical knowledge in mathematics, chemistry and physics to solve complex practical problems in the field of construction and civil engineering.

PC4. Ability to choose and use appropriate equipment, materials, tools and methods for designing and implementing technological processes of construction production.
SC7. Ability to take responsibility for making and making decisions in the field of architecture and construction in unpredictable work contexts

Program learning outcomes (PLO) of the educational programme:

Expected Learning Outcomes (ELO):

PLO1. Apply basic theories, methods and principles of mathematical, natural, social, humanitarian and economic sciences, modern models, methods and decision support software to solve complex construction and civil engineering problems.
PLO2. Participate in research and development in the field of architecture and construction.
PLO3. Design and implement technological processes of construction production, using appropriate equipment, materials, tools and methods.
PLO7. Collect, interpret and apply data, including through the search, processing and analysis of information from various sources.

THE STRUCTURE OF DISCIPLINE

Topic	**Hours** (lectures/laboratory, practical, seminars)	**Learning outcomes**	**Tasks**	**Estimation, units**
4 semester				
Module 1. The calculation of complex beam				**40**
Theme 1. The quantitative stage of kinematic analysis of flat systems	2/2	Student should be know the basic of calculation of complex beams Student should be able to build the diagrams of internal forces and for complex beams. To analyze the diagrams of internal forces and for complex beams. To understand the diagrams of internal forces and for complex beams. To distinguish between types of of the diagrams of internal forces and for complex beams. To apply different types of the diagrams of internal forces and for complex	Submitting a workshop. Completing tests. Writing independent works. Self-study (Performing practice and independent work in "Elearn"). Problem solving, of structural mechanics theory.	**5**
Theme 2. The structural analysis of complex structures	2/2/2			**5**
Theme 3. Calculation of simple beam	2/2/			**5**
Theme 4. The kinetic analysis of complex beam	2/2/2			**5**
Theme 5. Static calculation of composite beams	2/2/4			**5**
Theme 6. The construction of lines of influence of support reactions for statically indeterminate beams	2/2/			**5**
Theme 7. The construction of the influence line of the bending moment for a simple supported beam	2/2/			**5**
Theme 8. The construction of the influence line of the	2/2/			**5**

shearing force for a simple supported beam		beams in buildings.		
Module 2. The calculation of trusses				**30**
Theme 1. The construction of the influence line of internal efforts for the cantilever beam	2/2/	Student should be know the basic of calculation of trusses Student should be able to determinate the internal efforts of truss by different methods. To analyze the result of calculation of trusses. To understand the basis of truss calculation. To distinguish between types of truss loads. To apply different method of truss calculation in buildings.	Submitting a workshop. Completing tests. Writing independent works. Self-study (Performing practice and independent work in "Elearn"). Problem solving, of structural mechanics theory.	**4**
Theme 2. The construction of influence lines of internal efforts for complex by general method	2/2/			**4**
Theme 3. The construction of influence lines of internal efforts for complex beams by the kinematic method.	2/2/			**4**
Theme 4. The method of joints.	2/2/2			**5**
Theme 5. The method of sections	2/2/2			**5**
Theme 6. The method of compatible sections	2/2/1			**4**
Theme 7**.** The calculation of flat trusses under snow load	2/2/2			**4**
Total for 4 semester	**30/30/15**	**-**	**-**	**70**
Credit				**30**
Total for 4 semester				**100**
5 semester				
Module 3. The calculation of arch				**40**
Theme 1. The definition of support reaction of simple arch.	2/2/1	Student should be know the basic of calculation of complex archs. Student should be able to build the diagrams of internal forces and for complex archs. To analyze the diagrams of	Submitting a workshop. Completing tests.. Self-study (Performing practice and in "Elearn"). Problem solving, of structural mechanics theory.	**5**
Theme 2. The construction of diagram of normal force for simple arch.	2/2/1			**5**
Theme 3. The construction of diagram of shear force for simple arch.	2/2/1			**5**

Theme 4. The construction of diagram of bend moment for simple arch.	2/2/1	internal forces and for complex archs. To understand the diagrams of internal forces and for complex archs. To distinguish between types of of the diagrams of internal forces and for complex archs. To apply different types of the diagrams of internal forces and for complex archs in buildings..		**5**
Theme 5. The definition of support reactions for a three-hinge arch under vertical loads.	2/2/1			**5**
Theme 6. The definition of support reactions for a three-hinge arch under random loads.	2/2/1			**5**
Theme 7. The construction of diagrams of normal and shear force for a three-hinge arch..	2/2/1			**5**
Theme 8. The construction of diagram of bend moment for a three-hinge arch.	2/2/1			**5**
Module 4. The calculation of the complex frames				**30**
Theme 1. The calculation of three-hinge arch under moving loads.	2/2/1	Student should be know the basic of calculation of complex frames. Student should be able to build the diagrams of internal forces and for complex frames. To analyze the diagrams of internal forces and for complex frames. To understand the diagrams of internal forces and for complex frames.	Submitting a workshop. Completing tests.. Self-study (Performing practice and in "Elearn"). Problem solving, of structural mechanics theory.	**4**
Theme 2. The calculation of simple frame.	2/2/1			**4**
Theme 3. The calculation of e complex frame.	2/2/1			**4**
Theme 4. The calculation of statically indeterminate systems by force method	2/2/1			**5**
Theme 5. The Calculation of statically indeterminate systems by method of deflections	2/2/1			**5**

Theme 6. Stability of buildings. The basis of calculation of structures by the method of limit states	2/2/1	To distinguish between types of of the diagrams of internal forces and for complex frames. To apply different types of the diagrams of internal forces and for complex frames in buildings.		**4**
Theme 7. Stability of buildings. Method of deflections.	2/2/1			**4**
Total for 4 semester	**30/30/15**	**-**	**-**	**70**
Exam				**30**
Total for course				**100**

EVALUATION POLICY

Policy regarding deadlines and resits:	Assignments submitted after the deadline without valid reasons will be graded lower. Resitting of modules will be allowed with the permission from the lecturer and in the presence of valid reasons (e.g. medical reasons).
Academic honesty policy:	Cheating during tests and exams is strictly prohibited (including the use of mobile devices). Coursework and research papers must contain correct citations for all sources used.
Attendance policy:	Class attendance is mandatory. In case of objective reasons (such as illness or international internships), individual learning may be allowed (in online format by the approval of the dean of the faculty).

SCALE OF ASSESSMENT OF STUDENT KNOWLEDGE

Student rating, points	**National grade based on exam results**	
	exams	**credits**
90-100	excellent	passed
74-89	good	
60-73	satisfactory	
0-59	unsatisfactory	not passed

RECOMMENDED SOURCES OF INFORMATION

1. A. Kutsenko. Structural Mechanics: Part I. Manual. Kyiv. 2022 – 184 p.
2. A. Kutsenko. Structural Mechanics: the calculations of complex arches and frames. Part II. Manual. Kyiv. 2023 – 250 p.
3. Alberto Carpinteri Structural Mechanics: a unified approach. Taylor & Francis Ltd | CRC Press, 2019. 780 p.
4. M.M. Bakhoum Structural Mechanics. Structural Engineering Dept., Faculty of Engineering, Cairo University, 2nd Print,. 2010. 1438 p.
5. Sachin M. Pore, Uttam R. Awari, Jyoti P. Bhusari Structural Mechanics – II. Nirali Prakashan, 2020. 201 p.
6. Video materials for lectures https://www.youtube.com/