

Ministry of Education and Science of Ukraine

ODESA STATE ACADEMY OF CIVIL ENGINEERING AND ARCHITECTURE

Institute of Civil Engineering and Construction
Department of reinforced concrete structures and transport facilities

SYLLABUS of an academic discipline

EARTHQUAKE ENGINEERING (SPECIAL COURSE)

Educational level	second (master's)	
Training program	selective	
Branch of knowledge	19	Architecture and building
Specialty	192	Construction and civil engineering
Educational program	scientific	
Scope of the discipline	4 ECTS credits (120 academic hours)	
Types of classroom activities	lectures, practical classes	
Individual and (or) group tasks	calculation and graphic work	
Forms of semester control	credit	

Teachers:

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In the process of studying this discipline, students FAMILIARIZE THE MAIN PROVISIONS OF THE THEORY OF EARTHQUAKE RESISTANCE AND ACQUIRE THE SKILLS OF USING THESE THEORIES IN ENGINEERING PRACTICE.

For example: The ability to determine the magnitude of seismic effects on buildings and structures determines the ability to select an adequate design scheme and its design calculation.

The prerequisites for studying the discipline are the acquisition of theoretical knowledge and practical skills in the following disciplines: resistance of materials, building mechanics, building structures, reinforced concrete structures, metal structures.

Program learning outcomes:

to know:

- laws and equations of resistance of materials;
- basic physical and mechanical properties of concrete, reinforcement, reinforced concrete;
- calculation methods for the strength, stiffness and stability of structures;
- valid regulatory documents (Eurocode 8, DBN, DSTU, GOST, etc.).

to possess:

- the software complex "Monomach" for the formation of the calculation model of the building and its calculation for seismic effects;
- the "Lira-SAPR" software complex for the formation of the calculation model of the building and its calculation for seismic effects, taking into account the non-linear static method of calculation;
- the method of creating calculation models and its analysis;
- a method of assessment of seismic resistance of buildings.

to be able:

- using the basic provisions of calculations, to evaluate the strength, stiffness and stability of individual elements when designing reinforced concrete structures and facilities for seismic regions;
- using appropriate methods, to assess the state, structural and operational reliability of elements of buildings and structures under the seismic influences;

THEMATIC PLAN

№	Name of topics	Number of hours			
		lectures	practical	laboratory	individual
Section 1. Basics of engineering seismology					
1.1	Causes and consequences of strong earthquakes	3			10
1.2	Earth structure. Mechanics of earthquakes.	3			10
1.3	Seismic waves. Instruments for recording oscillations.	3			10
1.4	Richter magnitude scale, MSK-64 intensity scale, influence of soil conditions on the intensity of seismic impacts	3	4		10
Section 2. Earthquake engineering					
2.1	Basic principles of designing earthquake-resistant structures	4	4		10
2.2	Spectral method for determining seismic loads, modern software complexes for calculating structures for seismic effects.	2	4		10
2.3	Design features of earthquake-resistant buildings	2	4		10
2.4	Methods of protecting buildings and structures from the effects of seismic vibrations.	2			10
	Methodic of assessment of seismic resistance of buildings	2			
	Total	24	16		80

Evaluation criteria and diagnostic tools

The minimum and maximum level of assessment for obtaining a "credit" in the discipline "Earthquake Engineering" is 60 and 100 points and can be achieved by the following assessment means:

Evaluation tools		The minimum number of points	The maximum number of points
Засоби оцінювання	Кількість у семестрі		
Calculation and graphic work	1	30	50
Knowledge control:			
- Current knowledge control (standardized tests), or	2	30	50
- Final (semester) control of knowledge	1		
Total		60	100

The calculation and graphical work is provided in the section "Earthquake engineering". In this work, a multi-storey residential building is considered, which must be calculated for seismic impact.

The student is required to: develop a three-dimensional design model in the Monomakh software, and determine the periods of oscillations and the magnitude of the distortions of the floors.

The work consists of two parts: calculation and graphic and is performed in the form of an explanatory note, including a graphic part (A-4 format).

Methodical recommendations for performing calculation and graphic work [1].

The control work is provided for the sections "Basics of engineering seismology" and "Earthquake engineering". It is performed by students in the classroom and consists of cases of individual tasks (problems). For example: determine the forms and periods of oscillations of a multi-storey building.

Twice a semester, express knowledge control is conducted - standardized tests (10 test questions), for example

1. Loose water-saturated sands, prone to liquefaction; bulk soils; quicksand, biogenic soils and silt belong to

- A. I category of soils by seismic properties
- B. II category of soils by seismic properties
- C. III category of soils by seismic properties
- D. IV category of soils by seismic properties

2. Which of the following schemes has the highest seismic resistance

- A. With walls made of brick, natural stone
- B. Frame and stone
- C. Steel frame
- D. Reinforced concrete frame with diaphragms or stiffening cores

The final control of knowledge is conducted for students who were unable to gain the required number of points for any reason, or for students who wish to increase the number of points already gained. The final control of knowledge is carried out in the form of an oral conversation with the teacher (commission of teachers) on the subject of the discipline.

Information support

Key literature

1. 1. Murashko O.V., Methodical instructions from the discipline "Earthquake engineering" to the calculation and graphic work "Calculation of a multi-story building for seismic effects" for students of the specialty 7.060101 ODABA Publishing House, 2023, 41 p.
2. Eurocode 8: Design of structures for earthquake resistance - Part 1 : General rules, seismic actions and rules for buildings. 231 p.

Additional sources of information

3. Eurocode 8: Seismic Design of Buildings Worked examples. ISBN 978-92-79-23068-4. 521 p.