

Ministry of Education and Science of Ukraine



ODESA STATE ACADEMY OF CIVIL ENGINEERING AND ARCHITECTURE

Civil Engineering Institute
Department of Metal, Wooden and Plastic Structures

SILABUS **educational component – EC 6** Metal structures of industrial buildings

Educational level	Master's
Field of knowledge	19 Architecture and Construction
Specialty	192 Building and Civil Engineering
Educational program	Industrial and Civil Engineering
Educational component scope	6 credits ECTS (180 academic hours)
Types of classroom training	Lectures, practical classes
Individual tasks	Course project
Forms of final (term) control	exam

Lecturer(s):

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When studying the educational component, higher education students will develop the following skills and competences to analyze and choose calculation schemes of transverse frames of steel frames of industrial buildings; method of calculation and design of through and continuous frame columns industrial buildings; method of calculation and design of roof rafter trusses.

Requirements for studying the educational component: Strength of materials, Construction mechanics, Building structures, Metal structures part 1, 2.

Program learning outcomes:

PLO3. The ability to use regulatory and legal acts in everyday and professional life activities; to navigate in scientific, special literature and laws.

PLO 4. The ability to practically carry out measures to protect personnel and the population from the consequences accidents, disasters, natural disasters and the use of weapons; evaluate the stability of elements of objects economic activity in emergency situations and determine the necessary measures regarding it increase; evaluate the radiation, chemical, bacteriological environment and the environment that can occur as a result of a natural disaster and accident.

PLO 7. The ability to assess the danger of aggressive influences on building structures and structures – atmospheric, chemically and biologically active environments, leakage currents and stray currents, etc., develop and implement measures to protect against them and ensure the necessary durability of structures and buildings.

PLO 8. Use the technical Ukrainian language orally and in writing.

PLO 9. Ability to design structures from modern materials; evaluate work and the stress state of buildings and structures in general, their structural elements, redistribution of efforts in connection with a change in the design scheme; solve the issue of assessment of bearing capacity constructions

PLO 12. The ability to carry out inspections of the technical condition of buildings, structures and engineering communications, and give an assessment of this state; evaluate their further operational

suitability or the need to develop a project to restore this suitability; calculate the required level increasing the bearing capacity of the structure to ensure the operational suitability of the building.

PLO 13. Ability to design buildings and structures, including using software computer design systems based on an effective combination of innovative technologies and performing multivariate calculations of metal structures.

PLO 14. Design structures of buildings and structures in order to ensure their strength, stability, durability and safety, ensuring reliability.

PLO 15. Perform technical and economic justifications of constructive, technological, organizational solutions for the construction or reconstruction of buildings and structures, to develop technical documentation for projects and their elements.

PLO 17. The ability to find optimal solutions when creating certain types of construction products taking into account architectural and planning requirements, strength, durability, safety life activity, quality, cost, terms of execution and competitiveness.

Differentiated program learning outcomes:

to know:

- rules for calculation and design of through and continuous columns of industrial frames buildings;
- rules for calculation and design of roof rafter trusses;
- rules for calculation and design of steel frames of frames of industrial buildings;
- rules for designing elms for columns and covering industrial buildings.

to possess:

- a method of determining optimal constructive solutions when creating individual types of building structures;

to be able to:

- apply the method of calculation and design of steel structures
- frame of an industrial building - continuous and through columns, rafters
- trusses, elms on columns and covering.

Thematic plan

Topic 1. Designs of one-story industrial buildings. General characteristics frames of industrial buildings and basic requirements for their structures.

Topic 2. Layout of transverse frames. Determination of vertical and horizontal dimensions

Topic 3. Design and calculation of continuous centrally compressed columns. Joints and nodes columns

Topic 4. Design and calculation of through centrally compressed columns. Joints and nodes of columns

Topic 5. Design and calculation of the column base. Types of column bases. General and separate bases. Column base elements.

Topic 6. Connections between columns and covering. Half-timbered longitudinal and end walls. Sites, walls, gates, lanterns.

Topic 7. Features of the calculation of transverse frames. Actual work of the frame under load.

Topic 8. Layout of rafter truss structures. General sizes of farms. Unification and modulation of geometric dimensions. Determination of loads and forces in truss rods.

Determination of calculated lengths and ultimate flexibility of rods. Design requirements light farms
General requirements for the construction of heavy trusses. Knots on bolts and rivets. Knots during assembly welding. Nodes of heavy tubular trusses.

Topic 9. Columns in frames of industrial buildings. Types of columns. Calculated lengths. Solid columns. Calculation and construction of through columns. Column nodes. Heads and bases columns, their construction and calculation.

Topic 10. Under-crane constructions, their characteristics, loads. Solid under-crane beams, their calculation and construction. Construction of coatings. Coverage by spans. Seamless coating.

Score criteria and diagnostic tools

The minimum and maximum score for the «exam» in the educational component «Metal structures of industrial buildings» ranges from 60 points to 100 points.

The educational component includes the following task – course project.

The project considers the design of a steel frame of a single-span industrial building.

The student needs to: determine the geometric dimensions of the transverse frame of the frame, assemble loads, determine the calculation scheme, find the most unfavorable combinations of efforts and design a truss and a two-stage column.

Term control is carried out in the form of exam. The exam grade is assigned based on the answers to the examinee's questions card on the topic of the educational component in accordance with the thematic plan.

Information support

Main sources of information

1. DBN V.2.6-198:2014 "Steel structures. Design standards with Amendment No. 1" of the Ministry of Regions of Ukraine. - K.: 2022. 220 p.
2. DBN B.1.2. - 2: 2006 "Loads and influences. Design norms with Amendment No. 1 and No. 2", Ministry of Construction of Ukraine. - K.: 2020. 68 p.
3. Gilodo O.Yu., Kupchenko Yu.V., Singaivskiyi P.M. Methodical instructions for the course of the project on the topic "Design of a steel frame of a one-story industrial building". Odesa State Academy of Construction and Architecture, Odesa 2023. 134 p.
4. Gilodo O.Yu. Synopsis of lectures on the discipline Metal structures of industrial buildings for students of the master's degree in the specialty of PCB, Odesa, ODABA, 2020. 87 p.

Additional sources of information

5. "Metal structures in questions and answers: study guide / O. Yu. Gilodo. Odesa: Astroprint, 2019. 120 p.
6. Nilov O. O. Metal constructions. General course: a textbook for higher education institutions - Type 2nd, revision. and additional - K.: Stal, 2010. 869 p.