



Ministry of Education and Science of Ukraine

ODESA STATE ACADEMY  
OF CIVIL ENGINEERING AND ARCHITECTURE

Construction and Technological Institute  
Department of production of construction products and structures

**SYLLABUS**  
**of an academic discipline**

**MATERIAL SCIENCE**

Educational level	first (bachelor's)	
Training program	mandatory	
Branch of knowledge	19	Architecture and construction
Specialty	192	Construction and civil engineering
Educational program	Construction and civil engineering	
Обсяг дисципліни	<b>4 credits ECTS</b> (120 academic hours)	
Types of classroom classes	Lectures, practical classes	
Individual or group tasks	Calculation and graphic work	
Forms of control	Credit	

**Lecturer:**

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In the process of studying this discipline, students **OBTAIN THEORETICAL AND PRACTICAL DEFINITIONS OF THE VARIOUS TYPES OF BUILDING MATERIALS AND PRODUCTS, THE RELATIONSHIP BETWEEN THE PROPERTIES, COMPOSITION, BUILDING AND STRUCTURE OF THE MATERIAL, AND OBSERVE NEW PROGRESS IMPROVEMENTS EFFECTIVE AND RESOURCE-SAVING TECHNOLOGY, USING KNOWLEDGE TO OBTAIN HIGH-QUALITY MATERIALS AT MINIMUM COSTS.**

For example: The ability to design the composition of concrete, to determine the optimal conditions for the preparation of the material and the production process.

**The prerequisites for studying the discipline** are the acquisition of theoretical knowledge and practical skills in the following disciplines: physics, chemistry, building structures, technology of construction production.

**Program learning outcomes:**

to know:

- the main physico-chemical features of production and production of building materials for various purposes;
- basics of production technology and field of application;

To understand:

- how to determine the relationship between the composition, structure and properties of materials, which opens up wide opportunities for creating materials with the necessary special and operational characteristics;
- how to use rationally the modern building materials, products and structures based on knowledge of their technical characteristics and manufacturing technology.

To have:

- knowledge and skills for obtaining the specialty "civil engineer";
- skills of applying theoretical knowledge in the field of design, technology, economy and organization in production;
- the composition and development trends of the material and technical base of construction;

To be able:

- to determine types of construction materials and products;
- to determine the relationship between the properties, composition, structure and structure of the material;
- to observe new improvements in progressive and resource-saving technology;
- to determine optimal conditions for preparation of materials and production processes;
- to use knowledge to obtain high-quality materials at minimal costs;
- to design concrete compositions;
- to participate in research and development in the field of architecture and construction<sup>4</sup>
- to design and implement technological processes of construction production, using appropriate equipment, materials, tools and methods;
- to design construction structures, 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 contemporary requirements of regulatory documentation, time and other restrictions in the field of architecture and construction, environmental protection and labor safety;
- to assess the compliance of projects with the principles of designing urban territories and infrastructure objects and urban economy.

## THEMATIC PLAN

№№	Name of topics	Number of hours			
		lectures	practical	laboratory	individual work
1.	Classification of construction materials. Properties of building materials. Mechanical properties of building materials	2			6
2.	Natural building materials. Forest materials. Defects of wood	2	2		6
3.	Natural stone materials. Classification of rocks	2			6
4.	Ceramic materials and products. General Information. The general scheme of production of ceramic products	2	2		6
5.	Inorganic binders. Hardening of lime. Hydraulic binders	2	2		6
6.	Portland cement. Main properties. Assertions. Concrete and their products. General information and classification	2	2		10
7.	Materials for heavy concrete. Fillers. Light and porous concretes. Building mortars	2	2		10
8.	Metal materials and products. Cast iron. Corrosion of metals and methods of protection against it	2	2		6
9.	Materials and products from silicate melts. Production of glass. Types of glass and glass products used in construction	2			6
10.	Thermal insulation and acoustic materials and products. Inorganic and organic thermal insulation materials and products	2	2		6
11.	Bituminous and tar binders and materials based on them. Asphalt and tar concretes and mortars	2	2		6
12.	Varnishing materials. Artificial inorganic pigments	2			6
	<b>Totally</b>	<b>24</b>	<b>16</b>		<b>80</b>

### Evaluation criteria and diagnostic tools

The minimum and maximum evaluation level for obtaining a "credit" in the academic discipline "Materials Science" is 60 and 100 points and can be achieved by the following assessments means:

Evaluation tools		Minimum number of points	Maximum number of points
	Quantity per semester		
Calculation and graphic work	1	30	50
Knowledge control:			
- Current knowledge control (standardized tests)	2	30	50
- Final (semester) knowledge control	1		
<b>Totally</b>		<b>60</b>	<b>100</b>

**The calculation and graphical work** consists of two parts: theoretical and calculation and is performed in the form of an explanatory note (A4 format).

According to the individual task in the calculation part, it is necessary:

- to select the main components that are needed for the production of non-autoclave hardening foam concrete (cement, sand, water, additives);
- to calculate the number of warehouses and silos for storage of the main components of foam concrete and their area.

The theoretical part describes the production technology of foam concrete and the main characteristics of raw materials.

Methodical recommendations for performing calculation and graphical work [4]. Express control of knowledge in the form of a test and/or essay is conducted twice per semester. The abstract is presented in the form of text material with the necessary illustrations in the form of tables, diagrams, drawings in the total volume of 15-20 pages of A4 format.

**The final control of knowledge** is conducted for students who, for any reason, could not score the required number of points, or for students who wish to increase the number of points already scored. The final control of knowledge is carried out in the form of an oral conversation with the teacher.

#### 4. Information support

##### Key literature

1. Building materials science: Textbook/ P.V. Kryvenko, K.K. Pushkaryova, V.B. Baranovskyi et al. - K.: LLC UPVS "Ex Ob", 2004. - 704 p.
2. Building materials science: Textbook/ P.V. Kryvenko, K.K. Pushkaryova, V.B. Baranovskyi et al. - K.: "Lira" Publishing House, 2012. - 624 p.
3. Barabash I.V. Concrete technology/ I.V. Barabash, O.A. Kucherenko. – Odesa: Astroprint, 2003.–272 p.1. Production base of construction: Textbook / V.I Hots, N.O. Amelina, V.G. Nesterov – K.: KNUBA, 2010. – 312 p.
4. Hnyp O.P., Lavrenyuk L.I., Barabash T.I., Paruta V.A. Methodical instructions for performing laboratory work in the discipline "Materials Science" for students of the direction "Architecture", a special type of activity "Architecture of buildings and structures" full-time education, ODABA, 2014. - 50 p.

Additional sources of information

5. Golubnychy A.V. Production base of construction: Training manual/ A.V. Golubnychy.– K.: KNUBA, 2002.–228 p.
6. E.K. Karapuzov Materials and technologies in modern construction: Textbook/ E.K. Karapuzov, V.G. Soroha, T.E. Ostapenko–K. Higher education, 2004. - 416 p.