



## Syllabus

Program of educational discipline



# Equipment and design of engineering systems to provide skills and safety

**Code and name of specialty**  
263 - Civil Security

**Institute**  
Educational and Scientific Institute of Mechanical Engineering and Transport

**Educational program**  
Occupational safety and health

**Department**  
Occupational and environmental safety (144)

**Level of education**  
Master's level

**Type of discipline**  
Profiled discipline package 01 "Labor protection"

**Semester**  
2

**Language of teaching**  
English

## Teachers, developers



### Olena Maksimenko

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Candidate of Technical Sciences, Associate Professor, Associate Professor of the Department of Occupational Safety and the Environment of NTU "KhPI".

Teaching experience - 23 years. Author and co-author of more than 69 scientific and educational and methodical publications, the main courses he teaches: "Theory of combustion and explosion", "Ecology", "Fundamentals of ecology", "Assessment of impact on the environment", "Occupational safety in professional activities".

Learn more about the teacher on the department's website

<https://web.kpi.kharkov.ua/safetyofliving/uk/prepod/>

## General information

### Abstract

The discipline is aimed at forming students' knowledge about the design features of equipment, technical protection systems used to ensure professional and industrial safety of engineering systems, methods and foundations of their design, practical skills in using calculation methods of individual types. equipment of engineering systems.

### Purpose and objectives of the disciplines

The student's acquisition of competence, knowledge, abilities and skills to used in engineering networks. As a result of studying the discipline, a specialist should know the legal framework for labor protection, the basics of designing and safe operation of equipment and engineering systems, their design features for making urgent decisions and measures to ensure professional and industrial safety.

### Format of classes

Lectures, practical work, independent work, consultations. Final control - exam.

## Competences

General competences

CG03 Ability to identify, pose and solve problems

CG 04 Ability to apply knowledge in practical situations

CG 06 Determination and persistence in relation to assigned tasks and assumed responsibilities

CG 07 Ability to learn and master modern knowledge

CG 10 Skills of performing safe activities

CG 12 Ability to search, process and analyze information from various sources

CG 13 Ability to evaluate and ensure the quality of the work performed

SC09 The ability to present the results of one's engineering activities in compliance with generally accepted norms and standards.

## Learning outcomes

LO06 Create and theoretically substantiate the designs of machines, mechanisms and their elements based on the methods of applied mechanics, general design principles, the theory of interchangeability, standard methods of calculating machine parts

LO07 Apply regulatory and reference data to control compliance of technical documentation, products and technologies with standards, technical conditions and other regulatory documents.

## Scope of the discipline

The total volume of the discipline is 120 hours. (4 ECTS credits): lectures – 32 hours, practical work – 16 hours, independent work – 72 hours.

## Course prerequisites

Prerequisites of the course

To successfully pass the course, you need to have knowledge and practical skills in the following disciplines: «Technogenic and environmental safety in the conditions of industrial and economic activity», «Occupational and professional safety», «»Organization of safe electricity consumption.

## Features of the course, teaching and learning methods, and technologies

Lectures are held interactively with the use of multimedia technologies. Practical classes use a project-based approach to learning, game methods, and focus on the application of information technologies in labor protection.

## Program of educational discipline

### Lecture topics

**Topic 1. Introduction.** Normative documents in the field of design and operation of engineering networks Course goal and main directions of development of environmentally safe technologies and equipment.

**Topic 2.. Stages of design.** The sequence of development of technical and working projects Specifications and initial data for design.

**Topic 3. General plan of the enterprise.**

Selection of a site for construction. Composition of the general plan of the enterprise.

**Topic 4. Installation design of industrial installations.**

The sequence of designing the assembly work. Requirements for routing pipelines.

**Topic 5. Organization of the enterprise.**

Output data and layout design sequence. Types of layout, conditions of use Structural materials in design, their selection. Main construction materials, their selection.

**Topic 6. Marking of carbon and stainless steels.**

Selection of structural materials for aggressive environments.

**Topic 7. Pipelines. Classification and standardization of pipelines.** Fields of application of pipeline transport of industries

Details of pipelines. Connecting pipes.

**Topic 8-11. Equipment and operation of water, sewage, heat and gas networks.**

Operation of engineering structures, their testing General requirements for safe operation of engineering networks.

**Topics of the workshops**

**Practical work 1.** Issuance of initial data for design.

**Practical work 2.** Operation of high-risk equipment (on the example of cylinders)

**Practical work 3.** Calculation of initial data for the design of the engineering network of the ventilation installation.

**Practical work 4.** Occupational safety during repair work of engineering equipment.

**Practical work 5.** Calculation of hydraulic resistance of pipelines.

**Practical work 6.** Maintenance and repair of water supply networks.

**Practical work 7.** Checking technological equipment for tightness.

**Practical work 8.** Estimated water consumption in cold and hot water supply systems

**Topics of the laboratory classes**

Laboratory work within the discipline is not provided.

**Independent work**

Additional materials (textbooks) are recommended to students for independent study and analysis of issues submitted for independent study. The results are drawn up in a written report, presentations.

**Literature and study materials**

Basic literature

Occupational safety in professional activities. Part II. Ensuring man-made safety and safe working conditions O.G. Yanchyk, V.F., Rayko, Yu.A. Petrenko and others / Nach. manual/ – NTU "KhPI", Kharkiv: 2020. – 316 p. <a href="http://repository.kpi.kharkov.ua/handle/KhPI-Press/47119">http://repository.kpi.kharkov.ua/handle/KhPI-Press/47119</a>
Prevention of industrial accidents [Electronic resource]: training. manual / O. G. Yanchyk [etc.] ; National technical University "Kharkiv Polytechnic Institute". - Kharkiv, 2022. - 180 p. <a href="https://repository.kpi.kharkov.ua/handle/KhPI-Press/55980">https://repository.kpi.kharkov.ua/handle/KhPI-Press/55980</a>
Engineering systems of water supply and drainage of settlements and enterprises: education. manual / M. A. Zeitlin [etc.] ; National technical University "Kharkiv Polytechnic Institute". - Kharkiv: A. M. Panov, 2022. - 118 p. <a href="https://repository.kpi.kharkov.ua/handle/KhPI-Press/61106">https://repository.kpi.kharkov.ua/handle/KhPI-Press/61106</a>
Basics of occupational safety and health: a textbook / Yu. G. Masikevich, V.F. Rayko, O. V. Shestopalov, O. G. Yanchyk, and others. - Chernivtsi: "Misto", 2023. - 288 p. <a href="https://repository.kpi.kharkov.ua/handle/KhPI-Press/65280">https://repository.kpi.kharkov.ua/handle/KhPI-Press/65280</a>
DSTU B V.1.1-36:2016. Determination of categories of premises, buildings and external installations according to explosion and fire hazard. - Approved by order of the Ministry of Regional Development of Ukraine dated June 15, 2016 No. 158.
Code of Civil Protection of Ukraine. – Approved by the Verkhovna Rada Resolution No. 5403-VI of October 2, 2012. Edition of 2018

## Assessment system

### Criteria for assessing the student's success and distribution of points

100% of the final grade consists of assessment results in the form of credit (30%) and current assessment (70%).  
Assessment: written assignment (2 questions from theories + problem solving) and an oral report.  
Current rating:  
2 online tests (15% each), practical work (40%).

### Assessment scale

The sum of the points	National assessment	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfied	D
60–63	Satisfied	E
35–59	Unsatisfactorily (further study required)	FX 1–34
-	Unsatisfactorily (needs repeated study)	F

## Norms of academic ethics and policy of the course

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": show discipline, education, benevolence, honesty, responsibility. Conflict situations should be openly discussed in study groups with the teacher, and if it is impossible to resolve the conflict, it should be brought to the attention of the employees of the institute's directorate.

Regulatory and legal support for the implementation of the principles of academic integrity of NTU "KhPI" is posted on the website: <http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/>

## Approval

The syllabus has been agreed

Date of approval, signature

Head of Department  
Sergij VAMBOL

20.09.2023



Date of approval, signature

Guarantor of the educational  
program  
Viacheslav BEREZUTSKYI

20.09.2023

