Fundamentals of CAD

Specialty
133 – Industrial machinery engineering

Institute
Educational-scientific Institute of Mechanical Engineering and Transport

Educational program
Industrial machinery engineering

Department
Hydraulic Machines (150)

Level of education
Bachelor's level

Course type
Obligatory (professional)

Semester
2

Language of instruction
English, Ukrainian

Lecturers and course developers

Kseniia Riezva

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Candidate of Technical Sciences, Associate Professor of the Department of Hydraulic Machines of NTU "KhPI"

Work experience is 10 years.
Author and co-author of more than 60 scientific and educational works. Courses: "Technical equipment and technology of well repair", "Introduction to the specialty. Introductory practice", "Hydrogasdynamics", "Hydraulics", "Basics of scientific research", "Fountain and gas safety in the oil and gas industry", "Machines and equipment for wells drilling, equipment for oil and gas production".

Yevhenii Krupa

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Candidate of Technical Sciences, Associate Professor of the Department of Hydraulic Machines named after G.F. Proscura of NTU "KhPI"

The author of more than 50 scientific and educational works (articles, manuals, monographs, patents on a useful model). Courses: "Fundamentals of bladed hydraulic machines theory", "Hydraulic turbines and reversible hydraulic machines", "Fundamentals of CAD for bladed hydraulic machines", "Design of bladed hydraulic machines"

General information

Summary

The course introduces students to the most general methods and means of modern design, with the technology of developing graphic design documentation in the AutoCAD environment.

Course objectives and goals

The formation of practical skills in the development of graphic design documentation in the AutoCAD environment, the development of the ability to geometrically model products, reading engineering drawings, the development of two-dimensional and three-dimensional geometric modeling skills in the AutoCAD environment.

Format of classes

Lectures, laboratory works, consultations, individual calculation and graphic tasks. Final control in the form of an exam.

Competencies

GC-1 Ability to think abstractly.
GC-7 Ability to communicate in a foreign language.
GC-10 Skills in the use of information and communication technologies.
SC-1 Ability to apply typical analytical methods and computer software tools for solving engineering problems of industrial mechanical engineering, effective quantitative methods of mathematics, physics, engineering sciences, as well as appropriate computer software for solving engineering problems of industrial mechanical engineering.
SC-8 Ability to act socially responsibly and consciously.

Learning outcomes

LA-3 Know and understand the systems of automatic management of objects and processes of industrial engineering, to have skills in their practical use.
LA-4 Carry out engineering calculations to solve complex problems and practical problems in industrial mechanical engineering.
LA-8 Understand the relevant methods and have the skills to design typical assemblies and mechanisms in accordance with the task.
LA-14 Develop machine parts and assemblies using automated design systems.

Student workload

The total volume of the course is 90 hours (3 ECTS credits): lectures - 16 hours, laboratory works - 16 hours, self-study - 58 hours.

Course prerequisites

To successfully complete the course, it is necessary to have knowledge and practical skills in the following subjects: Vocational Language, Descriptive Geometry, Engineering and Computer Graphics, Fundamentals of Informatics, Entry into the Specialty. Introductory Practice

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

In the lectures, various methods of oral presentation of information are used: maintaining attention for a long time, activating the listeners' thinking; techniques that ensure logical memorization: persuasion, argumentation, evidence, classification, systematization, generalization, etc.
The method of discussion of educational material and discussion is used in lectures. The discussion makes it possible to significantly deepen and systematize knowledge and understanding of a particular problem, to check the basis of the conclusions reached by students during the study of a specific topic. The discussion method develops students' ability to defend their views and beliefs. The discussion helps to identify, logically and critically consider different points of view, scientific concepts and approaches to the issues under consideration. The organization and support of the discussion is achieved by using the

following methods: asking questions (main, additional, leading, etc.), discussing the answers and opinions of students, correcting the answers and formulating conclusions.

Visual and practical teaching methods. Among the visual methods of learning, illustration and demonstration are used. Illustration - showing students posters, maps, graphs, sketches on the board. During distance education, lecture material is presented in the form of presentations with pictures and videos.

The material is available on the Microsoft 365 resource and on the Moodle platform.

Program of the course

Topics of the lectures

Topic 1. Introduction to AutoCAD.
Installing and running AutoCAD. AutoCAD window. Entering AutoCAD system commands.
Topic 2. Work organization in AutoCAD.
Unit of measurement. Borders of the drawing board and its display on the screen. Properties of objects. Types of lines. Setting the thickness of the line. Layer installation. Tabs for switching drawing modes. Basic drawing commands in AutoCAD. Inscriptions on the drawing.
Topic 3. Building and editing graphic objects. Conjugation Applying dimensions.
Commands for building graphic objects. Commands for editing graphic objects. Applying dimensions. Building of the part outline.
Topic 4. Projection drawing of the part. Construction of views and sections of the part. Hatching execution and editing.
Means of construction of images in projection connection. Commands for building graphic objects. Commands for editing graphic objects. Building of a projection drawing.
Topic 5. Basics of work in the three-dimensional AutoCAD environment.
Workspace for 3D modeling. Visual screen management tools. View Cube tool. Using GIZMO to edit objects. Creation of primitives. Creation of drawings based on 3D models.
Topic 6. Building and editing solid objects.
Commands for building two-dimensional closed-form objects. Solid object building teams. Building a three-dimensional model based on its projections.

Topics of the workshops

There are no practical classes.

Topics of the laboratory classes

1. First steps. Simple commands.
2. Step-by-step plan for creating templates
3. Principles of drawing.
4. Creating a frame and stamp. Creating a table.
6. Creating layers. Hatching execution and editing.
7. Hot keys and drawing binding.
8. Dimensions, dimensional style and fonts.
9. The basics of working in three-dimensional environment. Creation of primitives.
10. Building 3D models

Self-study

The course involves the completion of an individual calculation and graphic task.

Course materials and recommended reading

1. https://www.autodesk.com/support/account/education/onboarding/students-guide
2. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/ https://images.autodesk.com/adsk/files/autocad_aca_user_guide_english.pdf
3. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://images-na.ssl-images-amazon.com/images/I/C1BxaOC0-IS.pdf

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4. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/
https://static.sdcpublications.com/pdfsample/978-1-63057-339-3-1-cw77gw9lwo.pdf

Assessment and grading

Criteria for assessment of student performance, and the final score structure

Description of the final score structure:
Exam (online test) - 25 points
Laboratory works - 50 points
Calculation and graphic task - 25 points

Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.
Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/

Approval

Approved by	Date, signature	Head of the department Andrii ROGOVYI
	Date, signature	Guarantor of the educational program Iryna Tynianova

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