Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Department of Machines and Apparatus of Chemical and Oil Refining Production

"Computer-aided design systems: AutoCAD"

The silhouette of the discipline

Details of the discipline	
Level of higher education	**First (bachelor's) degree**
Field of expertise	13 - Mechanical engineering
Specialty.	133 - Industrial engineering
Educational program	"Computer-integrated technologies for designing chemical engineering equipment"
Status of the educational component	Selective
Scope of the discipline	120 hours/ 4 ECTS credits
Year of study, semester	3 (2 for the accelerated form) year of study, fall semester
Form of study	Full-time (daytime)
Class schedule	1 lecture and 2 computer workshops every two weeks
Semester control / control measures	Credit / MCQs
Language of instruction	Ukrainian
Information about the course leader / teachers	D., Associate Professor, Seminsky Oleksandr Olehovych, forstd@ukr.net , @mahnv_kpi; Volodymyr Kosenko, v.v.kosenko@kpi.ua
Placement of the course	http://ci.kpi.ua

Program of the discipline

1. Description of the discipline, its purpose, subject matter and learning outcomes

The discipline "Computer-aided design systems: AutoCAD" is designed to expand the basic competencies in the field of professional application software for equipment design, which provides a complement to the basic component of professional training of students in the program "Computer-integrated technologies for the design of chemical engineering equipment" in accordance with the requirements of stakeholders.

The purpose of the discipline is to master the means and techniques of computer-aided design using the AutoCAD software package by Autodesk.

The discipline forms the following ***competencies***:

- Ability to think abstractly.
- Ability to apply knowledge in practical situations.
- Ability to plan and manage time.
- Ability to generate new ideas (creativity).
- Skills in the use of information and communication technologies.

- Ability to learn and master modern knowledge.
- Ability to apply typical analytical methods and computer software tools for solving chemical engineering problems, effective quantitative methods of mathematics, physics, engineering sciences, as well as appropriate software for solving chemical engineering problems.
- Ability to implement engineering developments in industrial engineering, taking into account technical, organizational, legal, economic and environmental aspects throughout the entire life cycle of machines and devices: from design, construction, operation, maintenance, diagnostics and disposal.
- Ability to use computer-aided design systems and specialized application software to solve problems in chemical engineering.
- Ability to realize creative and innovative potential in project developments in the field of processes and equipment of chemical and related technologies.

The ***program learning outcomes*** after studying the discipline include:

- Analyze engineering objects, processes, and methods.
- Understand the methods and have the skills to design standard equipment, its components and elements in accordance with the task.
- Develop machine parts and assemblies using computer-aided design systems.

2. Prerequisites and post-requisites of the discipline (place in the structural and logical scheme of study in the relevant educational program)

The discipline is based on the educational components "Engineering and Computer Graphics" and "Fundamentals of Computer Engineering". It provides special courses of professional training, primarily Machine Parts, Calculation and Design of Typical Equipment, and Processes and Equipment of Chemical Technology, as well as the educational components Undergraduate Practice and Graduate Design.

3. Content of the discipline

Topic 1: Getting started with AutoCAD.

Topic 2. Improving the efficiency of design.

Topic 3: Design of drawings.

Topic 4: 3D modeling.

Topic 5. Automation of design.

Topic 6: Features of the design of architectural objects.

Topic 7. Special AutoCAD tools.

Topic 8: Features of collaborative work on projects in AutoCAD.

4. Training materials and resources

Basic literature:

1. Prytula, N.O. (2021). *AutoCAD graphic design system. Computer workshop*. Igor Sikorsky Kyiv Polytechnic Institute.
2. Nadkernychna, T.M. (2020). *Course of computer graphics in the AutoCAD environment. Theory. Examples. Tasks*. Igor Sikorsky Kyiv Polytechnic Institute.
3. Pandey, J., Shoukry, Ya. (2022). *Practical Autodesk AutoCAD 2023 and AutoCAD LT 2023: A beginner's guide to 2D drafting and 3D modeling with Autodesk AutoCAD*. Packt Publishing.
4. CADArtifex, Willis, J., Dogra S. (2021). *AutoCAD 2022: A Power Guide for Beginners and Intermediate Users*. Independently published.
5. Leach, J., Lockhart, Sh. (2023). *AutoCAD 2023 Instructor: A Student Guide for In-Depth Coverage of AutoCAD's Commands and Features*. SDC Publications.

Educational content

5. Methods of mastering the discipline

Calendar and thematic plan

Week	*The content of the training work*	*SRS (66 hours according to the curriculum)*
1, And a week	**Lecture 1: Getting started** with AutoCAD.	Install and configure AutoCAD
2, And a week	**Computer Workshop 1.** Introduction to the AutoCAD interface: navigation and interaction with the interface; use of the main toolbars; setting up basic parameters.	Practical training on the topic of the class.
3, Week 2	**Computer workshop 2:** AutoCAD drawing basics: creating a new drawing; using the command line and dynamic menu; drawing and editing geometric objects.	Practical training on the topic of the class.
4, And a week	**Lecture 2:** Increasing the efficiency of design using layers and blocks.	Study the topic of the class. Work with the recommended literature.
5, And a week	**Computer workshop 3.** Working with layers and properties: creating and managing layers; setting up object properties; using filters.	Practical training on the topic of the class.
6, Week 2	**Computer workshop 4.** Working with blocks: creating and editing blocks; using dynamic blocks; inserting and scaling blocks.	Practical training on the topic of the class.
7, And a week	**Lecture 3** Drawing design.	Study the topic of the class. Work with the recommended literature.
8, And a week	**Computer workshop 5.** Text and styling: inserting and editing text elements; setting text styles; using text scales.	Practical training on the topic of the class.
9, Week 2	**Computer workshop 6.** Working with measuring tools: using a ruler and a measure; placing and editing dimensional lines; using dimensional annotation tools.	Practical training on the topic of the class.
10, And a week	**Lecture 4:** 3D modeling.	Working out the topic of the lesson. Work with the recommended literature.
11, And a week	**Computer workshop 7.** Scaling and printing drawings: working with zooming in and out; setting up print parameters; previewing and printing drawings.	Practical training on the topic of the class.
12, Week 2	**Computer workshop 8.** 3D modeling: familiarization with the 3D modeling interface; drawing and editing 3D objects; using 3D object modification tools.	Practical training on the topic of the class.

Week	*The content of the training work*	*SRS (66 hours according to the curriculum)*
13, And a week	**Lecture 5.** Automation of design.	Working out the topic of the lesson. Work with the recommended literature.
14, And a week	**Computer workshop 9.** Visualization and rendering: setting up lighting and materials; camera placement and views; using visualization and rendering tools.	Practical training on the topic of the class.
15, Week 2	**Computer workshop 10.** Automation and plug-ins: use of automatic commands and scripts; implementation of plug-ins and extensions; possibilities of workflow automation.	Practical training on the topic of the class.
16, And a week	**Lecture 6.** Features of the design of architectural objects.	Working out the topic of the lesson. Work with the recommended literature.
17, And a week	**Computer workshop 11.** Working with architectural elements and modes: using architectural elements and libraries; working with special AutoCAD Architecture modes; layout and design of architectural drawings.	Practical training on the topic of the class.
18, Week 2	**Computer workshop 12.** Editing surfaces and meshes: creating and editing surfaces; using mesh modeling tools; converting surfaces to meshes and vice versa.	Practical training on the topic of the class.
19, And a week	**Lecture 7.** Special AutoCAD tools.	Study the topic of the class. Work with the recommended literature.
20, And a week	**Computer workshop 13.** Working with animation and object visualization: creating animation trajectories and paths; using keyframes and interpolation; setting up object visualization parameters.	Practical work on the topic of the class.
21, Week 2	**Computer workshop 14.** Working with special tools and plug-ins: use of specialized tools; use of plug-ins to extend AutoCAD functionality; practical examples of using special tools and plug-ins.	Practical work on the topic of the class.
22, And a week	**Lecture 8.** Features of collaborative work on projects in AutoCAD.	Study the topic of the class. Work with the recommended literature.
23, And a week	**Computer workshop 15.** Preparing projects for collaboration: working with external links and importing images; organizing and managing project files; exporting and exchanging data with other programs.	Practical work on the topic of the class.

Week	*The content of the training work*	*SRS (66 hours according to the curriculum)*
24, Week 2	**Computer workshop 16.** Practical application of AutoCAD skills: completion of complex practical tasks and projects; implementation of individual projects according to your own needs; practical tips and tricks for effective use of AutoCAD.	Practical work on the topic of the class.
25, And a week	**Lecture 9.** Master class on design.	Study the topic of the class. Work with the recommended literature.
26, And a week	**Computer workshop 17.** Modular control work.	Preparing for a module test.
27, Week 2	**Computer workshop 18.** Final lesson: analysis of the results of the module control work, completion of the requirements for obtaining a credit.	Preparing for the final lesson.

6. Independent work of the student

The types of independent work are listed in the table in paragraph 5, according to the academic weeks and scheduled classes.

Policy and control

7. Policy of the academic discipline (educational component)

A system of requirements for students:

- **rules for attending classes** - attendance at all types of classes (lectures, computer workshops) is mandatory both in classrooms and in distance learning. In the latter case, classes are held in Zoom conferences and students attend them by connecting to the links provided by teachers;
- **rules of behavior in the classroom** - not to interfere with other students' listening to lectures or working in practical classes by unnecessary activities or conversations (including by phone). In the classroom and during distance learning at home, follow safety rules;
- **rules for crediting practical classes and awarding points for their completion** - the teacher evaluates the student's work during the class, the quality and timeliness of the presentation of the results of the assignment;
- **rules for awarding reward and penalty points** - no reward and penalty points are provided;
- **policy of deadlines and retakes**:
  1) all assignments are submitted and evaluated exclusively during classroom sessions;
  2) passing/retaking of the test is carried out according to the schedule established at the university level within the timeframe determined by the teacher and communicated to students when the rating scores are announced;
- **Policy on Academic Integrity** - students are required to comply with the provisions of the Honor Code and the requirements of academic integrity during the educational process.

8. Types of control and rating system for assessing learning outcomes (RSO)

Current control. Students receive points:

1. For completing computer workshops - up to 5 points for each workshop (maximum 75 points for all workshops):

5 points are awarded for excellent performance of the task;

4 points are awarded for good performance of the task;

3 points are awarded for satisfactory completion of the task;

1-2 points are awarded for a sufficient level of performance of the assignment, taking into account the completeness of the work and timely submission.

2. Up to 25 points for completing a module test. Points are awarded based on the completeness and correctness of the work.

Calendar control: is carried out twice a semester on weeks 7-8 and 14-15 as a monitoring of the current state of fulfillment of SilaBus requirements - a student receives "satisfactory" during the first and second calendar control if his/her current rating is at least 0.5 of the maximum number of points possible at the time of control.

Semester control is carried out in the form of a test, which is given at the last practical lesson based on the results of work in the semester in accordance with the student's rating in the discipline.

Conditions of admission to semester control:

- admission to the test is possible only in case of successful completion of all computer workshops and writing of the ICR;
- students who received a total rating score of < 25 during the semester are not allowed to take the test.

Table of correspondence between rating points and grades on the university scale:

Number of points	*Assessment.*
100-95	Excellent
94-85	Very good
84-75	Okay.
74-65	Satisfactory
64-60	Enough
Less than 60	Unsatisfactory
The conditions for admission are not met	Not allowed

9. Additional information on the discipline (educational component)

Lectures are held in the form of master classes supplemented by explanations of theoretical material.

Retakes are conducted according to a "soft" scheme (with the points gained during the semester). In this case, 10 penalty points are removed for each retake.

The silhouette of the discipline:

Compiled by Oleksandr Seminskyi, Associate Professor of the Department of MAHNV, Candidate of Technical Sciences, and Volodymyr Kosenko, Assistant Professor.

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Approved by the Methodological Commission of the Faculty of Engineering and Chemistry (Minutes No. 10 of May 26, 2023).