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

Department of Machines and Apparatus of Chemical and Oil Refining Production

"Fundamentals of computer design"

The syllabus of the discipline

Details of the discipline	
Level of higher education	**First (bachelor's) degree**
Field of expertise	13 - Mechanical engineering
Specialty.	133 - Industrial machinery engineering
Educational program	"Industrial Engineering"
Status of the educational component	Normative
Scope of the discipline	150 hours/ 5 ECTS credits
Year of study, semester	1st year of accelerated training, fall semester
Form of study	Full-time (daytime)
Class schedule	1 lecture and 3 laboratory classes every two weeks
Semester control / control measures	Examination / ICR, GR
Language of instruction	Ukrainian
Information about the course leader / teachers	phD, 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 "Fundamentals of computer design" is intended to form basic competencies in the field of professional application software designed for the design of equipment, which provides the basis for professional training of students in the program "Computer-integrated technologies for the design of chemical engineering equipment".

The aim of the discipline is to master the tools and techniques of computer design.

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).
- Ability to conduct research at a certain level.
- Ability to act in a socially responsible and conscious manner.
- Ability to motivate people and move towards a common goal.
- Skills in the use of information and communication technologies.
- Ability to work in a team.
- 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 evaluate the technical and economic efficiency of typical systems and their components based on the application of analytical methods, comparison of analogues and the use of available data.
- Ability to make effective decisions on the choice of construction materials, equipment, processes and combine theory and practice to solve engineering problems.
- Ability to realize creative and innovative potential in project developments in the field of processes and equipment of chemical and related technologies.
- Ability to carry out commercial and economic activities in the field of chemical engineering, organization and maintenance of chemical and related industries.
- Ability to develop plans and projects in the field of chemical engineering under uncertain conditions aimed at achieving the goal, taking into account the existing constraints, to solve complex problems and practical problems of product quality improvement and control.

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

- To know and understand the principles of technological, fundamental and technical sciences underlying the engineering of equipment for chemical and related technologies.
- 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 component of the Engineering and Computer Graphics program and provides special courses of professional training, primarily Machine Parts, Calculations and Design of Typical Equipment, and Chemical Technology Processes and Equipment, as well as the educational components Pre-degree Practice and Diploma Design.

3. Content of the discipline

Topic 1: Getting started with Autodesk Inventor.

Topic 2. Design stages.

Topic 3. Composite elements.

Topic 4. Standard products.

Topic 5. Preparation of design documentation.

4. Training materials and resources

Basic literature:

1. Kostyukova, T.I. Engineering graphics. Workshop: a textbook for students of higher educational institutions. Lviv: New World 2000 Publishing House, 2022. 364 p.

2. Marchevsky V.M. Design documentation of course and diploma projects: a textbook for students of higher educational institutions.

3. YouTube channel Junior Engineer [Electronic resource]: https://www.youtube.com/@junior_engineer.

4. DSTU ISO 10209-1:2009 Technical documentation for products. Glossary of terms. Part 1: Technical drawings. General terms and types of drawings (ISO 10209-1:1992, IDT).

5. Technical drawings. General principles of design: DSTU ISO 128-34:2005 (ISO 128-34:2001, IDT) : national standard of Ukraine : introduced for the first time : in force since 2004-07-01 : English translation = Technical drawings. General principles of presentation = Technical Drawings. General Principles of Presentation. Ч. 34. Views on mechanical engineering drawings = Views On Mechanical Engineering Drawings. Kyiv: Derzhspozhyvstandart Ukrainy, 2007.

Additional reading:

1. Autodesk. Autodesk Inventor 2023 Help [Electronic resource]: https://help.autodesk.com/view/INVNTOR/2024/ENU/.

2. Autodesk Inventor YouTube channel [Electronic resource]: https://www.youtube.com/@AutodeskMFG.

3. Autodesk Inventor on the forum [Electronic resource]: https://forums.autodesk.com/t5/inventor/ct-p/70.

4. Kishore T. Learn Autodesk Inventor 2018 Basics: 3D Modeling, 2D Graphics, and Assembly Design (1st ed. 2017) / Kishore.

5. Dogra S. Autodesk Inventor 2022: A Power Guide for Beginners and Intermediates / Dogra. 2021. - 790 p.

Educational content

5. Methods of mastering the discipline (educational component)

Calendar and thematic plan

Week	*The content of the training work*	*SRS (78 hours according to the curriculum)*
Topic 1: Getting started with Autodesk Inventor.		
1, I week	**Lecture 1:** Getting started with Autodesk Inventor: installing, configuring, and familiarizing yourself with the interface.	Install and configure Autodesk Inventor
2, I week	**Lab 1:** Setting up a workspace in Autodesk Inventor. Working with the interface	Practical training on the topic of the class.
3, II week	**Lab 2:** Learning the basic tools of Autodesk Inventor.	Practical training on the topic of the class.
4, II week	**Laboratory session 3:** Learning the Autodesk Inventor auxiliary tools.	Practical training on the topic of the class.
Topic 2. Design stages.		
5, I week	**Lecture 2:** Tolerances and fits of smooth joints.	Study the topic of the class. Work with the recommended literature.
6, I week	**Laboratory session 4.** Working with the Create functions: lines and curves.	Practical training on the topic of the class.
7, II week	**Laboratory session 5.** Working with Create functions: geometric shapes.	Practical training on the topic of the class.

Week	*The content of the training work*	*SRS (78 hours according to the curriculum)*
8, II week	**Laboratory session 6.** Working with Create functions: constructive primitives.	Practical training on the topic of the class.
9, I week	**Lecture 3** Calculation of planting characteristics.	Study the topic of the class. Work with the recommended literature.
10, I week	**Laboratory session 7.** Working with the text.	Practical training on the topic of the class.
11, II week	**Laboratory lesson 8.** Projective geometry.	Practical training on the topic of the class.
12, II week	**Laboratory session 9.** Working with geometry changes.	Practical training on the topic of the class.
13, I week	**Lecture 4.** Surface shape and location tolerances.	Working out the topic of the lesson. Work with the recommended literature.
14, I week	**Laboratory lesson 10.** Working with dimensions.	Practical training on the topic of the class.
15, II week	**Laboratory session 11:** Establishing and manipulating geometric dependencies.	Practical training on the topic of the class.
16, II week	**Laboratory lesson 12.** Establishing relationships between geometric elements.	Practical training on the topic of the class.
17, I week	**Lecture 5.** Normalization of tolerances for the shape and location of surfaces.	Working out the topic of the lesson. Work with the recommended literature.
18, I week	**Laboratory lesson 13.** Auxiliary geometry.	Practical training on the topic of the class.
19, II week	**Laboratory session 14.** Elements of solid modeling: extrusion, rotation.	Practical training on the topic of the class.
20, II week	**Laboratory session 15.** Elements of solid modeling: shear, profiling, nonlinear extrusion.	Practical training on the topic of the class.
21, I week	**Lecture 6.** Surface roughness.	Working out the topic of the lesson. Work with the recommended literature.
22, I week	**Laboratory session 16.** Elements of solid modeling: spatially complex objects.	Practical training on the topic of the class.
23, II week	**Laboratory session 17.** Creating derivative lenses.	Practical training on the topic of the class.
24, II week	**Laboratory session 18.** Creating scans of non-sheet objects.	Practical training on the topic of the class.
Topic 3. Composite elements.		
25, I week	**Lecture 7.** Selection of tolerances.	Study the topic of the class. Work with the recommended literature.

Week	*The content of the training work*	*SRS (78 hours according to the curriculum)*
26, I week	**Laboratory session 19.** Design of connecting elements.	Practical training on the topic of the class.
27, II week	**Laboratory lesson 20.** Design of housing elements.	Practical training on the topic of the class.
28, II week	**Laboratory lesson 21.** Design of welded elements.	Practical training on the topic of the class.
Topic 4. Standard products.		
29, I week	**Lecture 8.** Tolerances of angles, cones and tapered joints.	Study the topic of the class. Work with the recommended literature.
30, I week	**Laboratory lesson 22.** Libraries of standard products.	Practical training on the topic of the class.
31, II week	**Laboratory session 23.** Methods of "direct" editing.	Practical training on the topic of the class.
32, II week	**Laboratory lesson 24.** Assembly of structures.	Practical training on the topic of the class.
Topic 5. Preparation of design documentation.		
33, I week	**Lecture 9.** Unspecified maximum deviations of linear and angular dimensions, shape and surface location tolerances.	Performing an individual task.
34, I week	**Laboratory session 25:** Preparation of design documentation.	Performing an individual task.
35, II week	**Laboratory lesson 26.** Defense of graphic work.	Performing an individual task.
36, II week	**Laboratory lesson 27.** Module control work	Preparing for a module test.
-	-	Preparing for the exam

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, laboratory classes) 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) retakes of the exam are 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 laboratory classes - up to 2 points for each class (maximum 50 points for all laboratory classes):
   2 points are awarded for excellent performance of the task;
   1 point is awarded for completing tasks with comments or inaccuracies.
2. For the execution and defense of graphic work:
   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.
3. For completing a module test:
   5 points are awarded for excellent performance of the task;
   4 points are awarded for very good performance;
   3 points are awarded for good performance of the task;
   2 points are awarded for satisfactory completion of the task;
   1 point is awarded for a sufficient level of task completion.

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 conducted in the form of a written examination based on tickets, the task of which consists of two parts: 1) design development; 2) drawing. Each part is worth a maximum of 20 points.

Conditions of admission to semester control:

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

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 syllabus of the discipline:

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Approved by the Methodological Commission of the Faculty of Engineering and Chemistry (Protocole No. 11 of June 28, 2024).