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

Department of Machines and Apparatus of Chemical and Oil Refining Production

"3D Engineering Methods "

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	120 hours/ 4 ECTS credits
Year of study, semester	3rd year, spring semester
Form of study	Full-time (daytime)
Class schedule	1 lecture every two weeks and 1 computer workshop every week
Semester control / control measures	Credit / ICR, abstract.
Language of instruction	English
Information about the course leader / teachers	phD, Associate Professor, Seminsky Oleksandr Olehovych, forstd@ukr.net , @mahnv_kpi; Mykyta Byshko, m.byshko@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 "3D Engineering Methods" is designed to develop students' competencies in the field of professional application software for the design of equipment, which provides the basis for professional training 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).
- 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 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.

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 program "Engineering and Computer Graphics", complements the educational component "Fundamentals of Computer Design" and provides special courses of professional training, primarily "Calculations 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: SolidWorks interface and basic settings.

Topic 2. Sketches.

Topic 3: Solid geometry.

Topic 4. Composition.

Topic 5. Creating drawings based on a model.

4. Training materials and resources

Basic literature:

1. Kozyar M.M., Feshchuk Y.V., Parfeniuk O.V. Computer graphics. SolidWorks: a textbook / M.M. Kozyar, Y.V. Feshchuk, O.V. Parfeniuk - Kherson: OLDI-PLUS, 2018. - 251 p.
2. Marchevsky V.M. Design documentation of course and diploma projects: a textbook for students of higher educational institutions.
3. 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. Introducing SolidWorks. URL: https://my.solidworks.com/solidworks/guide/SOLIDWORKS_Introduction_EN.pdf (accessed March 16, 2023).

2. Shih R.H., Schilling P.J. Parametric Modeling with SOLIDWORKS 2022. - SDC Publications, 2022. - 600 p.

3. Planchard D.C. SOLIDWORKS 2020 Quick Start. / D.C. Planchard. - SDC Publications, 2020. - 280 p.

Educational content

5. Methods of mastering the discipline (educational component)

Calendar and thematic plan

Week	*The content of the training work*	*SRS (66 hours according to the curriculum)*
Topic 1: SolidWorks interface and basic settings.		
1, I week	**Lecture 1:** Interface and basic settings of the SolidWorks program.	Installing and configuring SolidWorks.
2, I week	**Computer workshop 1:** Setting up a workspace in SolidWorks. Working with the interface	Practical training on the topic of the class.
3, II week	**Computer workshop 2:** Familiarization with the peculiarities of working in SolidWorks.	Practical training on the topic of the class.
Topic 2. Sketches.		
4, I week	**Lecture 2.** Creating sketches.	Study the topic of the class. Work with the recommended literature.
5, I week	**Computer workshop 3.** Geometric elements for creating sketches.	Practical training on the topic of the class.
6, II week	**Computer workshop 4:** Tools to work with graphic primitives.	Practical training on the topic of the class.
7, I week	**Lecture 3.** Working with dimensions and relations.	Study the topic of the class. Work with the recommended literature.
8, I week	**Computer Workshop 5:** Working with Dimensions and Text.	Practical training on the topic of the class.
9, II week	**Computer workshop 6.** Working with relations.	Practical training on the topic of the class.
Topic 3: Solid geometry.		
10, I week	**Lecture 4.** Basic operations of solid-state modeling. Examples of application.	Working out the topic of the lesson. Work with the recommended literature.
11, I week	**Computer workshop 7.** Basic operations: pulling, cutting. Displaying the construction.	Practical training on the topic of the class.
12, II week	**Computer workshop 8.** Basic operations: complex geometry.	Practical training on the topic of the class.
13, I week	**Lecture 5.** Additional operations of solid modeling. Examples of application.	Working out the topic of the lesson. Work with the recommended literature.
14, I week	**Computer workshop 9.** Additional operations.	Practical training on the topic of the class.

Week	*The content of the training work*	*SRS (66 hours according to the curriculum)*
15, II week	**Computer workshop 10.** Use of auxiliary geometry.	Practical training on the topic of the class.
16, I week	**Lecture 6.** Auxiliary operations of solid modeling. Examples of application. Methods of working with solid-state models.	Working out the topic of the lesson. Work with the recommended literature.
17, I week	**Computer workshop 11.** Auxiliary operations and their application.	Practical training on the topic of the class.
18, II week	**Computer workshop 12.** Technique of parts development.	Practical training on the topic of the class.
Topic 4. Composition.		
19, I week	**Lecture 7.** Assembly elements. Examples of application.	Study the topic of the class. Work with the recommended literature.
20, I week	**Computer workshop 13.** Design of connecting elements.	Practical training on the topic of the class.
21, II week	**Computer workshop 14.** Design of housing elements.	Practical training on the topic of the class.
Topic 5. Creating drawings based on a model.		
22, I week	**Lecture 8.** Creating drawings: parts, assemblies and specifications.	Study the topic of the class. Work with the recommended literature.
23, I week	**Computer workshop 15.** Creating views and working with them. Setting dimensions and labels.	Practical training on the topic of the class.
24, II week	**Computer workshop 16.** Preparation of drawings and specifications.	Practical training on the topic of the class.
25, I week	**Lecture 9.** Master class on designing in SolidWorks.	Performing an individual task.
26, I week	**Computer workshop 17.** Modular control work.	Preparing for a module test.
27, II week	**Computer workshop 18.** Credit lesson	Preparing for a test 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) retakes 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 completing computer workshops - up to 4 points for each lesson (maximum 64 points for all computer workshops):
   4 points are awarded for excellent performance of the task;
   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.
2. For completing a module test (maximum 16 points):
   14-16 points are awarded for excellent performance of the task;
   11-13 points are awarded for very good performance of the task;
   9-11 points are awarded for a good performance of the task;
   6-8 points are awarded for satisfactory completion of the task;
   1-5 points are awarded for a sufficient level of performance.
3. For completing an individual assignment in the form of an essay (maximum 20 points):
   20 points are awarded for excellent performance of the task;
   17-19 points are awarded for very good performance of the task;
   14-16 points are awarded for a good performance of the task;
   11-13 points are awarded for satisfactory completion of the task;
   1-10 points are awarded for a sufficient level of performance.

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 is "certified" during the first and second calendar controls if his or her current rating is at least 0.5 of the maximum number of points possible at the time of the control.

Semester control is carried out in the form of a test, which is given at the last computer workshop 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 tasks of the computer workshop, presentation of the abstract 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)

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 Seminsky, Associate Professor of the Department of MAHNV, Candidate of Technical Sciences, Associate Professor, and Mykyta Byshko, Assistant.

Approved at the meeting of the Department of Machines and Apparatus of Chemical and Oil Refining Production (Protocole No. 20 of June 20, 2024).

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