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

Department of Descriptive Geometry, Engineering and Computer Graphics

Engineering & CoComputer Graphics
Work program of the discipline (Syllabus)

<div align="center">– Details of the discipline</div>

Level of higher education	*First (bachelor's)*
Field of knowledge	*16 Chemical and Bioengineering*
Speciality	*162 Biotechnology and Bioengineering*
Educational program	*Biotechnology*
Discipline status	*Compulsory (normative) (vocationaltraining* class*)*
Form of study	*forfull-time*
Year of preparation, semester	*I course, os* і *nn* і *i semester*
Scope of discipline	*4 (120)*
Semester control / control measures	*Passed*
Timetable	*Lecture – 4 hours* *Practical classes - 2 hours* *Computer practicum – 4 years* *1 modular control room*
Language of instruction	*Ukrainian*
Information about Course Leader / Instructors	*Department of Descriptive Geometry, Engineering and Computer Graphics (building 7, room 815), e-mail: http://geometry.kpi.ua/ Phone:+380 44 204 94 46* *Nadkernychna Tetyana Mykolayivna e-mail: t_nadker@ukr.net, mobile phone 0953340464*
Course Placement	https://do.ipo.kpi.ua/course/view.php?id=3178

<div align="center">– The program of the discipline</div>

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

The academic discipline belongs to the cycle of general training.

Subject of subject: methods of geometric modeling; graphical methods for solving engineering and geometric problems; methods of simplifying the solution of engineering graphics problems; requirements of standards for the design of design documentation, computer graphics systems.

Interdisciplinary relations: The discipline "Engineering and Computer Graphics" refers to the cycle of general training, which is based on the preliminary training of students in geometry, stereometry, physics, drawing and computer science within the programs of secondary education institutions, as well as knowledge of the basics of fundamental sections of the disciplines of higher mathematics, general physics, computer science and others in volumes that meet the requirements of the chosen profession.

The discipline "Engineering and Computer Graphics" lays the foundations for the discipline of processes and devices of biotechnological production, which are studied in senior courses; in the course and diploma of theFaculty of Economics.

1. Purpose and objectives of the discipline

The purpose of the discipline is to formstudents' modeling abilities by geometric and computer methods of drawing apparatus, machines, technological and hardware schemes of biotechnological industries in course and diploma projects.

After mastering the discipline, students must demonstrate the following learning outcomes:

knowledge:

•basic principles of geometric modeling of objects;

•Methods of construction and study of spatial objects based on their flat images in drawings;

• requirements of existing state, interstate and world standards that are in force on the territory of Ukraine and are used in the preparation of technical documentation in the field of technology and technology;

• capabilities of modern graphic editors for modeling objects, making and editing their images and drawings, as well as preparing design and technological documentation;

• Fundamental graphic and information training with a focus on the professional profile of the Faculty of Economics and Technology.

Skill:

• perform and read aboutthe images of any geometric and technical objects;

•use the drawing as a flat geometric model of the object, on which you can examine the same geometric parameters as on the real product;

• draw up design documents in accordance with the requirements of current standards;

• carry out design and technological documents with the help of automatedprocessing systems;

• apply knowledge of computer graphics, modern information technologies and the Internet;

• Use drawings at different stages ofthe procedure.

experience:

• making a freehand sketch and drawing with the help of drawing tools;

• work with informationand informationmeans;

•information management;

• knowledge of appropriate terminology and use of reference literature;

According to the requirements of the educational and professional program, students after mastering the discipline "Engineering andComputer Graphics" must demonstrate the following learning outcomes:

General Competencies

GC 1 Ability to apply knowledge in practical situations.

GC 5 Ability to learn and master modern knowledge

Professional competencies

FC 10. Ability to draw up technological schemes for the production of biotechnological products for various purposes

FC 11. Ability to draw up hardware diagrams for the production of biotechnological products for various purposes

Programmatic Learning Outcomes

PRN 18. Be able to substantiate and select appropriate technological equipment and graphically depict the technological process in accordance with the requirements of regulatory documents using the knowledge gained during practical training. 19. Be able to use computer-aided design systems to develop a technological and hardware scheme for biotechnological production

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

The discipline "Engineering and Computer Graphics" forms the engineering and technical component in the training program of the future specialist.

Students will be able to apply the obtained learning outcomes in the preparation of the following subjects: the basics for the discipline processes and devices of biotechnological production,

3. The content of the discipline

*A list of sections and topics of the entire **discipline** is* provided.

Form of study	Semester (credit) modules	Total credits/hours	Distribution of study time by types of classes				Semester Certification
			Lecture	Practical classes	Computer Practicum	SRS	
Day	Just	4/120	4	2	4	110	
	1	4/120	4	2	4	110	Passed

The course material is divided into two sections:

Chapter 1. Engineering Graphics

The main goals of engineering graphics are to master the methods of development and implementation of design documentation by students.

Chapter 2. Computer Graphics

The main goals of computer workshops are: mastering specific typical construction techniques, acquiring practical skills in constructing a drawing and solid mode.

As a result of studying the course, the student should gain knowledge, work experience and conscious application of the methods of *geometric modeling of spatial forms, the use of standardsfor the execution of working drawings.*

4. Training Materials & Resources

Basic literature:

1. *Vanin V.V., Perevertun V.V., Nadkernychna T.M., Vlasiuk A.G. Engineering graphics. – K. BHV Publishing Group. 2009.– 400 p.: ill. http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf*
2. *Methodical instructions for geometric and projection drawing/ Compiled by G.M. Koval.-k.: NTTU "KPI", 2014 – 36 p. http://geometry.kpi.ua/files/metod_kovalj.pdf*
3. *Computer Graphics Course in AUTOCAD Environment. THEORY EXAMPLES. TASKS [Electronic resource]: study. Helps. for students. specialty 105 "Applied Physics and Nanotechnology", specialization "Applied Physics" / T.M. Nadkernichna, O.A. Lebedeva; KPI them. Igor Sikorsky. – – Kyiv : KPI them. Igor Sikorsky, 2020. – 191 p. http://geometry.kpi.ua/files/Literature/Autocad_2020_Nadkernichnaya_Lebedeva.pdf*
4. *"Methodical instructions and educational tasks for the laboratory workshop on computer graphics on the topic "Constraints and dependencies in AutoCAD 15" for students of all technical specialties of NTUU "KPI" [Text] / Compilers: T.M. Nadkernichna, G.I. Tymkovych. – K.: NTUU "KPI", 2016. – 42 p*
    http://geometry.kpi.ua/files/ Manual%20Didactic%20material.pdf

Further reading:

1. *Vanin V.V., Blyok A.V., Gnitetska G.O. Design of design documentation. Manual. 4th ed., ed. And additional. – K.: Karavela, 2012.-200 p. http://geometry.kpi.ua/files/Vanin_Gniteckaja_kd1_2.pdf*

All of these literature is available in sufficient volume in the library of Igor SikorskyKyiv Polytechnic Institute. Igor Sikorsky.

Information Resources

1. *Short Lecture Course on Engineering Graphics http://ela.kpi.ua/handle/123456789\6764*
   2.Campus http://login.kpi.ua/.
3. *Library ftp://77.47.180.135/.*
4. *Methodical documentation of the website of the Department of http://ng-kg.kpi.ua/index.php?option=com_content&view=article&id=37:2010-06-05-04-40-02&catid=71:narisnauch1&Itemid=13*

– Educational content

5. Methods of mastering the discipline (educational component)

The program of the discipline provides for lectures, practical and computer workshops. In the case of distance learning mode, it is possible to use courses posted on the Sikorsky platform: problem-based, visualized lectures on the Zoom platform

Chapter 1. *Engineering graphics.*

Lecture 1. *Review lecture on the course of engineering graphics: Planes of projections. Thereis* a point *or a line. Their position* relative to the planes *is about* the *planes.*

Practical lesson 1. *The problems of constructing a complex drawing of a point, a line are considered . Comprehensive surface drawing.*

Independent work*.*Planes *(Specifying a plane on a diagram. Planes* of a special position: about *is* a plane of a special position. *Planes* of general position. *Zero traces* of a plane. Belonging of a line and a *point to a plane. Transformation of the plane of the general position into the* plane of the level *and* level.*), the surface of rotation. Construction of points and lines on surfaces*, *views*, *sections, sections. Create a projection drawing with sections. Drawing dimensions on the drawing. Dimensioning. Working drawings of parts obtained by machining*. *Threading. Threaded connections. One-piece joints. Drawing up a specification for an assembly unit.*

Chapter 2. *Computer graphics.*

Lecture 1. *Review lecture on the course Computer Graphics. AutoCAD program interface.* Create and *install layers. Specify the coordinates of points in the drawing. The Line command and the Erase, Copy, Textual information commands. Create text styles. Drawing generation commands using graphic primitives Xline, Circle, Ellipse, Polygon, Rectang, Spline. Image editing commands Trim, Extend, Move, Offset. Dimensions in drawings. Create dimension styles. Dimensioning in the ASAD system. Examples of execution.*

Computer Practicum 1. Graphical interface of the program. Configuring drawing parameters in AutoCAD. Execution of a geometric drawing – conjugation according to an individual task. Drawing design.

Computer Practicum 2. Superimposition of geometric and dimensional dependencies on the conjugation drawing according to an individual task. Creation of a drawing of an array according to an individual task. **Independent work.** *General requirements for the execution of design documents. Formats, main inscription, lines in drawings. Imposition of geometric and dimensional dependencies on the drawing. What* arrays *are used for. Create a variety of arrays. Organization of work in ACAD when constructing a projection drawing. Use object snaps and Polar Tracking mode in three types of models. Graphic designations of materials. Use the Bhatch command to apply hatching. Dimensioning.* Execution of a drawing of a geometric model (construction of views, sections) according to an individual task. Drawing

design.User's coordinate system. Working with view screens in three-dimensional space. Commands to build three-dimensional primitives. Work in three-dimensional space. Three-dimensional primitives. Construction of three-dimensional primitives according to an individual task. Obtaining a projection drawing with a 3D image. Create three-dimensional objects by rotating. Editing the shape of solids. Chamfering and conjugation of faces of solids.

– Policy & Control

6. Academic discipline policy (educational component)

The system of requirements that the teacher sets for the student/graduate student is indicated:
- *rules for attending classes (both lectures and computer workshops);*
- *rules of conduct in the classroom (activity, preparation of short reports or texts, disconnection of phones, use of communication tools to search for information on the teacher's Google Drive or on the Internet, etc.);*
- *rules for the protection of practical classes;*
- *rules for the protection of computer workshops;*
- *rules for the protection of individual tasks;*
- *rules for assigning incentive and penalty points;*
- *deadline and retake policy;*
- *academic integrity policy;*
- *other requirements that do not contradict the legislation of Ukraine and regulatory documents of the University.*

Academic Integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: https://kpi.ua/code

Standards of Ethical Conduct

The norms of ethical behavior of students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: https://kpi.ua/code

Procedure for appealing the results of control measures

Students have the opportunity to raise any issue that relates to the control procedure and expect it to be dealt with according to predetermined procedures.

7. Types of control and rating system for assessing learning outcomes (CRO)

Current control: protection of graphic works and works of computer workshops, modular Test. Minds.
Calendar control: it is carried out twice a semester as a monitoring of the current state of fulfillment of the requirements of the syllabus.
Conditions for admission to semester control: enrollment of all practical tasks and computer workshops.
The condition for the first calendar control is to receive at least 30 points, perform and defend two graphic works, two computer workshops and receive a positive mark from the modular control work. *The condition for the second calendar control is to receive at least 50 points, perform and defend four graphic works, four computer workshops and receive a positive mark from the modular control work.*
Conditions for admission to the final control: enrollment of all graphic works, protection of all computer workshops, a positive mark on the modular test.

The student's rating is calculated on a 100-point scale:
1. A student's rating in a credit module consists of the points that he/she receives for:
• execution and defense of graphic works (WG) (5 works);
• execution and defense of works on computer workshops (5 works);
• performance of modular control work;

2. Criteria for awarding points: 2.1. Execution and defense of graphic works are estimated at 9 points:

• *flawlessly done work, excellent graphics – 9 points;*
• *there are certain shortcomings in performance, good graphics, violation of the deadline for delivery up to 6*
weeks – 3 points;
• *there are significant deficiencies in performance, satisfactory graphics – 4 points;*
2.2. Performance and defense of works on computer workshops are evaluated at 9 points:
• *flawlessly done work, knowledge of teams – 9 points;*
• *there are certain deficiencies in execution, knowledge of commands, violation of the delivery schedule up to 6*
weeks – 3 points;
• *there are significant deficiencies in the performance and knowledge of the teams – 4 points;*
2.3. Performance of modular control work is estimated at 10 points:
• *flawlessly performed work - 10points;*
• *not significant deficiencies in the performance of work - 6 points;*
• *significant deficiencies in the performance of work - 2 points;*
• *the work was done incorrectly or not at all - 0 points.*
Express tests are carried out in the form of a programmed control of students' knowledge at the end of each topic at the beginning of the practical lesson for *10 minutes. Individual tasks of programmable control over the subject and complexity correspond to the exercises that students perform at the computer workshop. The results of the test are communicated to students in the same practical lesson. Such a schedule of control work provides a systematic The work of students during the study of this discipline and, as experience shows, significantly affects the improvement of the quality of education. Individual tasks are selected in such a way that their implementation requires updating the knowledge of students both from the lecture course and obtained in the process of completing tasks for each section of the computer workshop. The topics of individual tasks are provided on the website of the department, and are also attached to the work program.*
Calendar control: it is carried out twice a semester as a monitoring of the current state of fulfillment of the requirements of the syllabus.
Semester control - credit
Conditions for admission to semester control: minimum positive mark for an individual assignment / enrollment of all laboratory work / semester rating of more than 60 points.

Table of correspondence of rating points to grades on the university scale:

Score	Score
100-95	Perfectly
94-85	Very good
84-75	Well
74-65	Satisfactory
64-60	Enough
Less than 60	Disappointing
Admission conditions are not met	Not allowed

8. Additional information on the discipline (educational component)

Semester control: credit.

Conditions for admission to semester control: minimum positive mark for an individual assignment / enrollment of all laboratory work / semester rating of more than 60 points.

Work program of the discipline (syllabus):

Compiled by Senior Lecturer Nadkernychna Tetyana Mykolayivna.

Approved by the Department of NGIKG (protokol No. 6 of 25.0 5.2023)

Approved by the Methodological Commission on Accreditation in Biotechnology and Biotechnology (Protocol No. dated ___.__.202 3)