ENGINEERING AND COMPUTER GRAPHICS

Working program of the academic discipline (Syllabus)

Details of the academic discipline

Level of higher education	*First (undergraduate)*
Branch of knowledge	*17. Electronics and telecommunications*
Specialty	*171. Electronics*
Educational program	*171. Electronics*
Discipline status	*Normative*
Form of education	*full-time (day)/distance/mixed*
Year of training, semester	*1st year, autumn / spring semester*
Scope of the discipline	*6 (180);*
Semester control/ control measures	*Autumn semester - assessment, spring - exam*
Lessons schedule	*Autumn semester: lecture – once every two weeks (18 hours); practical classes - once every two weeks (18 hours).* *Spring semester: lecture – once every two weeks (18 hours); practical classes - once every two weeks (18 hours); computer workshop - once every two weeks (18 hours).*
Language of teaching	*Ukrainian*
Information about head of the course / teachers	*Department of descriptive geometry, engineering and computer graphics (building 7, room 815),, e-mail: http://geometry.kpi.ua/ Phone:+380 44 204 94 46* *Lecturer: Ph.D., associate professor, Olga Holova, olgagolovafire@gmail.com, 0988662045*
Placement of the course	https://do.ipo.kpi.ua/course/view.php?id=3178

Program of educational discipline

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

After mastering the course, students are able to demonstrate the following learning outcomes:
The purpose of the credit module is to form students' abilities to:
- ЗК5 – skills in using information and communication technologies;

- CK1 – the ability to use knowledge and understanding of scientific facts, concepts of theories, principles and methods for the design and application of electronics devices, devices and systems;
- CK2 – the ability to perform analysis of the subject area and regulatory documentation necessary for the design and application of electronics devices, devices and systems;
- CK3 – the ability to integrate knowledge of the fundamental sections of physics and chemistry to understand the processes of solid-state, functional and power electronics and electrical engineering;
- CK5 – the ability to apply appropriate mathematical, scientific and technical methods, modern information technologies and computer software, skills in working with computer networks, databases and Internet resources to solve problems in the field of electronics;
- CK6 – the ability to identify, classify, evaluate and describe processes in electronic devices, devices and systems using analytical methods, modeling tools, experimental samples and the results of experimental studies;
- CK7 – the ability to apply creative and innovative potential in the synthesis of engineering solutions and in the development of designs of electronic devices and systems;
- CK8 – the ability to solve engineering problems in the field of electronics, taking into account all aspects of development, design, production, operation and modernization of electronic devices, devices and systems;
- CK9 – the ability to determine and evaluate the characteristics and parameters of electronic equipment materials, analog and digital electronic devices for the design of microprocessor and electronic systems;
- CK10 - the ability to apply industry standards and quality standards for the functioning of electronic devices and systems in practice;
- CK11 – the ability to monitor and diagnose the condition of equipment, use modern electronic components and technical means, perform prevention, repair and maintenance of electronic devices and systems, mount, debug and repair analog, digital and optical modules, design and manufacture printed circuit boards, develop software provision for microcontrollers.
The main tasks of the credit module.
According to the requirements of the program of the academic discipline, after mastering the credit module, students must demonstrate the following learning outcomes, namely knowledge, skills and experience:
- P5 – use information and communication technologies, examples and specialized software products to solve problems of designing and debugging electronic systems, demonstrate programming skills, analysis and display of measurement and control results;
- P7 – to analyze complex digital and analog information and measurement systems with an extended architecture of computer and telecommunication networks, taking into account the specifics of the selected technical means of electronics and the corresponding technical documentation;
- P19 – application of knowledge of modern technologies of processing and protection of acoustic information, information technologies in the field of acoustic electronic systems.

Content of the academic discipline

Form of study		Total credits/hours	Distribution of study time by types of classes	CW GW	Semester certification

	Semester (credit) modules		Lectures	Practical classes	Computer workshop		
Daily	Total	4/120	36	36	18	2 1	
	1 semester	2/60	18	18		1 1	credit
Day	2 semester	2/60	18	18	18	1	exam

1. Content of the study discipline Engineering and computer graphics. Fundamentals of geometric modeling.

1 semester

Chapter 1. Representation of point, line, and plane models in the system of projection planes.

Topic 1.1. Projection methods: central and parallel. Orthogonal projection is the main method of construction of technical drawings. Specifying the position of the point model in the system of projection planes. Creation of a complex drawing point. Position of points in space relative to projection planes. Direct and inverse tasks (construction and reading of a projection drawing).

Topic 1.2. Representation of the straight line model in the system of projection planes. Specifying a straight line on the plot. Lines of a separate position: level and projecting. The line of general position. Traces of a straight line. Belonging to a point is a straight line. Division of a line segment in the given ratio. Modeling the mutual position of straight lines in space: parallelism, intersection, transience.

Topic 1.3. Representation of the plane model in the system of projection planes. Setting the plane on the drawing. Planes of a separate position: level and projecting. Trace-projection of the plane of a separate position. Planes of general position. Belonging to a line and a point in a plane. Modeling the relative position of planes in space: parallelism, intersection (separate cases).

Chapter 2. Methods of simplifying the solution of problems for modeling geometric objects in the space of the system of projection planes.

Topic 2.1. The method of replacing projection planes. The main tasks of the method of replacing the projection planes on the example of the line segment of the general position and the plane of the general position. Determination of the natural magnitude of a dihedral angle. Construction of a natural size of a flat figure.

Chapter 3. Modeling of curved lines and surfaces.

Topic 3.1. Flat and spatial curved lines. Class and order of the curve. Methods of modeling curved lines of the second order. Circle projection.

Topic 3.2. Surfaces. Surface modeling methods. Determinants of surfaces. Expandable and non-expandable linear surfaces. Surfaces of rotation. Construction of points and lines on surfaces.

Chapter 4. Modeling the intersection of geometric elements.

Topic 4.1. Modeling the intersection of surfaces with a plane. General method of crossing surfaces with a plane. Four classes of problems. Construction of the line (figure) of the

intersection of second-order surfaces by planes of individual and general position. Determination of the natural size of the cross-sectional figure. Sweeps.

Topic 4.2. Single and double penetration. The general method of solving problems on the penetration of surfaces with symmetric and asymmetric horizontal "windows". Concept of view and simple section.

Topic 4.3. Intersection of surfaces. Method of mediators. Individual cases of intersection of second-order surfaces. The use of mediators - planes of a separate position. Method of spherical mediators. Monge's theorem. Conclusions from the theorem.

4. Educational materials and resources

Basic literature

1. Інженерна графіка: підручник для студентів вищих закладів освіти I - II рівнів акредитації/ В.Є.Михайленко, В.В.Ванін, С.М.Ковальов; За ред. В.Є.Михайленка. - Львів: Піча Ю.В.; К.: Каравела; Львів: Новий світ - 2000. - 284.

2. Ванін В.В.,Бліок А.В.,Гнітецька Г.О. Оформлення конструкторської документації:Навч.посіб. 3-є вид.- К.: Каравела, 2012.-200 с. *http://geometry.kpi.ua/files/Vanin_Gniteckaja_kd1_2.pdf*

3. Ванін В.В, Перевертун В.В, Надкернична Т.М. та ін. Інженерна та комп′ютерна графіка. К.: Вид.гр.BHV, 2009. — 400 с.

Additional literature

4. Михайленко В.Є., Ванін В.В., Ковальов С.М. Інженерна та комп'ютерна графіка. — К.: Каравела, 2012. — 363 с.

5. Хаскін А.М. Креслення. — К.: Вища шк., 1985. — 440 с.

6. Курс комп'ютерної графіки в середовищі AUTOCAD. ТЕОРІЯ ПРИКЛАДИ. ЗАВДАННЯ [Електронний ресурс]: навч. посіб. для студ. спеціальності 105 «Прикладна фізика та нанотехнології», спеціалізації «Прикладна фізика» / Т.М. Надкернична, О.А. Лебедєва ; КПІ ім. Ігоря Сікорського. — Київ : КПІ ім. Ігоря Сікорського, 2020. – 191 с. Рекомендовано Методичною радою КПІ ім. Ігоря Сікорського як навчальний посібник для здобувачів ступеня бакалавра за спеціальністю 105 Прикладна фізика та наноматеріали. *http://geometry.kpi.ua/files/Literature/Autocad_2020_Nadkernichnaya_Lebedeva.pdf*

All the mentioned literature is available in sufficient quantity in the library of NTUU "KPI".

Information resource

7. Комплекс методичних матеріалів. Навчальна платформа дистанційного навчання «Сікорський» :https://do.ipo.kpi.ua/course/view.php?id=1995

8. Комплекс методичних матеріалів. Навчальна платформа дистанційного навчання «Сікорський»: https://do.ipo.kpi.ua/course/view.php?id=3187

9. Бібліотека *ftp://77.47.180.135/.*

10. Методична документація сайту кафедри сторінка Навчальна та методична література:*http://ng-*

Educational content

5. Methods of mastering an educational discipline (educational component)

The program of the academic discipline provides for lectures and practical classes. Methodical support for studying the course is the use of an information resource that presents a methodological set of materials: a lecture course with a step-by-step explanation of the educational material of individual course topics and the use of animation elements; video lessons; workbook, both in printed version and in the form of a website with an interactive step-by-step solution to homework and classroom tasks posted on the "Sikorsky" educational platform. In the case of distance learning, all these materials can be used for lectures and practical classes on the Zoom and other platforms, as well as be available when organizing students' independent work as part of remote access to information resources at a time convenient for them.

Lecture classes 1 semester

№	Topics of lectures
1	Projection methods. Central and parallel projection. Geometric modeling of spatial objects. Projection of a point on three mutually perpendicular planes. Complex point drawing. Methods of constructing the third projection of a point. Position of points relative to projection planes. Direct and inverse problems. Determination of the distance from a point to the planes and axes of the projections. Competing points. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.
2	Straight line projection. Specifying a straight line on the plot. Lines of a special position: level and projecting. The line of general position. Determination of the natural value of the line segment of the general position and the angles of inclination of the line to the projection planes. Belonging of a point to a straight line. Division of a line segment in a given ratio. Traces of a straight line. The relative position of two straight lines. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.
3	Projection of the plane.

	Specifying the plane on the epurse. Areas of special position. Trace-projection of the plane of a special position. Planes of general position. Belonging to a line and a point in a plane. The relative position of two planes. Curved lines Parallelism of planes. Intersection of planes of a special position. Intersection of planes of general and special position. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.
4	Methods of simplifying course problem solving. The method of replacing projection planes. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.
5	Curved lines. Classification of curved lines. Circle projection. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.
6	Methods of specifying surfaces, their definition, classification. Expandable and non-expandable linear surfaces. Surfaces of rotation. Construction of points and lines on the surface, conditions for their belonging to the surface**.** **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.
7	Intersection of surfaces by a plane. General method of crossing surfaces with a plane. Construction of the line (figure) of the intersection of second-order surfaces by planes of individual and general position. Determination of the natural size of the cross-sectional figure. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.
8	Intersection of surfaces of bodies. Single and double penetration. General method of solving problems. **Didactic tools:**

	https://do.ipo.kpi.ua/course/view.php?id=1995;	
	https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course.	
	Recommended Books: [1]	
	IWS: Doing homework in the workbook on this topic.	
9	Intersection of surfaces. Individual cases of intersection of surfaces, use of mediators - planes of a separate position, spheres. Monge's theorem. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.	

Practical training 1 semester

The name of the practical session	Number classroom hours
Practical lesson 1. Point projection. Solving problems on a complex drawing. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.	2
Practical lesson 2. Setting a straight line on a graph. Solving problems on a complex drawing. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.	2
Practical exercise 3. Setting the plane on the epurse. Solving problems on a complex drawing. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.	2
Practical lesson 4. The method of replacing projection planes. Solution of the problems of the method of replacing the projection planes using the example of the line segment of the general position and the plane of the general position. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course.	2

Recommended Books: [1] **IWS:** Doing homework in the workbook on this topic.		
Practical lesson 5. Curved lines. Solving problems on the projection of a circle. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.		2
Practical lesson 6. Surfaces. Solving problems on the construction of points and lines on surfaces. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.		2
Practical lesson 7. Intersection of surfaces by a plane. Solving problems on the intersection of surfaces with a plane. Construction of the natural size of the cross-sectional figure. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.		2
Practical lesson 8. Solving problems for the construction of single and double penetration of bodies through horizontal "windows". Designing the work according to the requirements of the standards. **Didactic tools:** https://do.ipo.kpi.ua/course/view.php?id=1995; https://do.ipo.kpi.ua/course/view.php?id=3187; workbook from the course. **Recommended Books:** [1] **IWS:** Doing homework in the workbook on this topic.		2
Practical lesson 9. Assessment		2

Lecture classes 2 semester

№	Topics of lectures
1	Types and rules of design of technical drawings. The system of ESCD standards - the main provisions. Formats. Scales. Lines. Fonts. Geometric drawing. Conjugation of geometric elements. Basic requirements for drawing dimensions on the drawing.

	Didactic tools: http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2]
2	Projection draftsman. Main images. Views, sections, sections. Classification of cuts. Simple cuts: horizontal, vertical, oblique. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].
3	Classification of cuts. Complex cuts: stepped, broken and combined. Peculiarities of their implementation. Drawing dimensions on the drawing. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].
4	Sketches and working drawings of details. Incision. Classification of threads. Image and designation of the thread on the drawing. A detail with a thread. **Didactic tools:** //ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].
5	Cleanliness of the surface of the part. Surface roughness parameters. Conventions for marking roughness on drawings. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].
6	Features of the implementation of the "Shaft" type part. Structural elements of the shaft. Remote elements. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].
7	Peculiarities of execution of the part of the "Cover" type. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].
8	Reading and execution of an assembly drawing. Peculiarities of placing dimensions on the assembly drawing. Compilation of the specification. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].
9	Detailing **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6].

Practical training 2 semester

The name of the practical session	Number

	classroom hours
Practical lesson 1. Types and rules of design of technical drawings. The system of ESCD standards - the main provisions. Formats. Scales. Lines. Fonts. Geometric drawing. Conjugation of geometric elements. Basic requirements for drawing dimensions on the drawing. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2]. **IWS:** Refinement of the sketch of the projection drawing of the wooden model using simple sections. *(A3).*	2
Practical lesson 2. Projection drawing. Main images. Views, sections, sections. Classification of sections. Simple cuts: horizontal, vertical, oblique. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Execution of the draftsman according to the sample.	2
Practical lesson 3. Simple sections. Applying dimensions. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Execution of the draftsman according to the sample.	2
Practical lesson 4. Complex cuts: stepped, broken and combined. Peculiarities of their implementation. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Execution of the draftsman according to the sample.	2
Practical lesson 5. Sketches and working drawings of details. Incision. Classification of threads. Image and designation of the thread on the drawing. A detail with a thread. Cleanliness of the surface of the part. Surface roughness parameters. Conventions for marking roughness on drawings. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Refinement of the sketch of the part with a thread (A3).	2
Practical lesson 6. Peculiarities of making sketches of parts of the "Shaft" type. Structural and technological elements of parts. General rules for applying dimensions. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Completion of the sketch of the "Shaft" part (A3).	2
Practical exercise 7. Peculiarities of sketching details of the "Cover" type.	2

Didactic tools: http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Completion of the sketch of the "Cover" part (A3).	
Practical lesson 8. Design stages. Connection of parts (threaded, gluing, soldering, welding). Assembly diagram of the node. Specification. **Didactic tools:** http://ng-kg.kpi.ua/files/Inz_graf_Vanin.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Performing calculations of simplified images of fastening elements of the assembly drawing "Threaded connections". Execution of the assembly drawing "Connections are inseparable" and specifications (A3).	2
Practical lesson 9. Detailing. **Didactic tools:** http://geometry.kpi.ua/files/detalirovaniye.pdf **Recommended Books:** [2], [3], [6]. **IWS:** Execution of the draftsman according to the sample.	2

Computer workshop 2 semester

The name of the computer workshop	Number classroom hours
Computer workshop 1. Graphical program interface. Setting the parameters of the draftsman in AutoCAD. Setting the border of the drawing and its display on the screen. Creating and installing layers. Setting the coordinates of points on the drawing. Setting coordinates in AutoCAD. Construction of the frame and the main inscription. Construction and editing of 2D graphic objects. Teams for drawing. editing, text information.	2
Computer workshop 2. Commands for drawing drawing using graphic primitives Xline, Circle, Ellipse, Polygon, Rectangl, Spline. Image editing commands Trim, Extend, Move, Offset. Dimensions on the drawings. Create dimensional styles. Drawing dimensions in the ACAD system. Implementation examples.	2
Computer workshop 3. Execution of a geometric drawing - conjugation according to an individual task. Drawing design.	2
Computer workshop 4, 5. Execution of a geometric model drawing (construction of views, sections) according to an individual task. Drawing design.	4
Computer workshop 6.	2

Work in three-dimensional space. Three-dimensional primitives. User coordinate system. Working with view screens in three-dimensional space. Commands for building three-dimensional primitives.. Creating a projection drawing from a 3D image. Construction of three-dimensional primitives according to an individual task.	
Computer workshop 7. Construction of a three-dimensional model of a complex shape according to an individual task. Creation of a three-dimensional model by the method of pushing out and Boolean operations. Building a three-dimensional model of a complex shape according to an individual task.	2
Computer workshop 8. Creation of three-dimensional objects by the method of rotation. Editing the shape of solids. Construction of chamfers and conjugation of faces of solid bodies. Construction of a three-dimensional model - a shaft.	2
Computer workshop 9. The last class according to the schedule is devoted to checking the completed works.	2

6. Independent work of a student/graduate student.

Hours assigned to the student's independent work are specified in clause 5. The method of mastering the academic discipline is the completion of homework, preparation for the performance of work in practical classes and a computer workshop; performance of calculation and graphic work, as well as preparation for the modular control work and exam.

Policy and control
7. Policy of academic discipline (educational component)

Studying the academic discipline "Engineering and computer graphics. "Computer engineering graphics" requires a higher education applicant to:
- observance of educational and academic ethics;
- compliance with the schedule of the educational process;
- be balanced, attentive in classes;
- systematically study theoretical material;
- compliance with the schedule of protection of graphic works, computer workshop, calculation and graphic work. The applicant's answer must show signs of independent performance of the assigned task, absence of signs of repetition and plagiarism.
If the student of higher education was absent from the lecture, then he should practice this lecture at another time (with another group, at a consultation, on his own, using methodical materials presented on the Sikorsky distance learning platform, video recordings, etc.).

If the student of higher education was absent from a practical lesson or computer workshop, he should work through the material of this practical lesson or computer workshop at another time (with another group, at a consultation, independently, using methodical materials presented on the distance learning platform Sikorskyi, video recordings, etc.).

8. Types of control and rating system for evaluating learning outcomes (ELO)

Current control: protection of graphic works and works of computer workshops, modular control work.

Calendar control: is conducted twice a semester as a monitoring of the current state of fulfillment of the syllabus requirements.

The condition of the first calendar control is to obtain at least 16 points, perform and defend two graphic works, two computer workshops and receive a positive evaluation from the modular control work. The condition of the second calendar control is to obtain at least 34 points, perform and defend four graphic works, four computer workshops, and perform modular and calculation-graphic work.

Conditions for admission to the final examination: admission of all graphic works, protection of all computer practicals, protection of computational and graphic work, positive evaluation of the modular control work.

The student's rating is calculated on a 100-point scale.

1 semester

- homework and classroom tasks (8 HW) on the topic of the lecture in the workbook - $8\text{x}5\text{p} = 40\text{p}$;
- programmable control (4 PC) - $4\text{x}10\text{p} = 40\text{p}$;
- execution of modular control work;
- performance and protection of graphic works (2 GW) - $2\text{x}10\text{p} = 20\text{p}$;
- implementation and protection of graphic and calculation work (GCW).

The maximum number of points per semester is 100 points.

2 semester

- programmable control (2 PC) - $2\text{x}10\text{p} = 20\text{p}$;
- performance and protection of graphic works (7 GW) $- 7\text{x}5\text{p} = 45\text{p}$;
- performance and defense of work from a computer workshop (6 CP) $- 6\text{x}5\text{p} = 35\text{p}$.

The maximum number of points per semester is 100 points.

2. Scoring criteria:

2.1. Completion of the tasks in the workbook is evaluated in 5 points according to the following criteria:

• flawlessly executed work, excellent graphics, work submitted on time - 5 points;

• there are certain shortcomings in the execution, good schedule, violation of the schedule of delivery up to 2-3 weeks - 3 points;

• there are significant shortcomings in the execution, satisfactory graphics, untimely submitted work - 2 points;

2.2. Programmable control (PC) (4 PCs);

• flawlessly performed work – 5 points;

• there are certain shortcomings in performance – 3 points;

• there are significant shortcomings in performance - 2 points;

2.3. Performance of the modular control work is estimated at 15 points:

• flawlessly performed work - 15 points;

• non-significant shortcomings in the performance of work - 12 points;

• significant shortcomings in the performance of work - 8 points;

• work performed incorrectly or not performed at all - 0 points.

    2.4. The execution and protection of graphic works is evaluated in 5 points:

• flawlessly executed work, excellent graphics - 5 points;

• there are certain shortcomings in the execution, good schedule, violation of the schedule of delivery up to 2-3 weeks - 3 points;

• there are significant shortcomings in execution, satisfactory graphics - 2 points;

    2.5. Completion of calculation and graphic work is estimated at 20 points:

• flawlessly performed work - 20 points;

• there are not significant shortcomings in the performance of work - 18 points;

• there are significant shortcomings in the performance of work - 8 points;

• work performed incorrectly or not performed at all - 0 points.

Calendar control: conducted twice a semester as a monitoring of the current status of meeting the syllabus requirements.

The condition of the first calendar control is to obtain at least 18 points and perform and defend three topics in the workbook, one graphic work, and receive a positive evaluation from two programmed control works. The condition of the second calendar control is to obtain at least 45 points and perform and defend three topics in the notebook, one graphic work, receive a positive grade from two programmed control works and perform calculation and graphic work. The condition for obtaining a credit in the first semester is the completion and protection of calculation and graphic work, problems in the workbook with 8 course topics, 2 graphic works, receiving positive grades from 4 programmed control works and a modular control work.

The condition for passing the exam in the 2nd semester is the completion and defense of graphic works, receiving positive grades from 2 programmed control works and passing all works from computer practicals.

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

Number of points	Evaluation
100-95	Excellent
94-85	Very good
84-75	Good
74-65	Satisfactory
64-60	is enough
Less than 60	Unsatisfactory
Admission conditions not met	Not admitted

Working program of the academic discipline (syllabus):

Compiled by: Associate Professor of the Department of Graphic Geometry, Engineering and Computer Graphics, Ph.D. Holova O.O.

Approved by the _NGIKH__ department (protocol No. _6__ dated 25.05.2023)

Agreed by the Methodical Commission of the Faculty of Electronics (protocol No. 06/2023 dated 06/29/2023)