NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
«Igor Sikorsky Kyiv Polytechnic Institute»
Educational and Scientific Institute of Mechanical Engineering
Department of manufacturing engineering

APPROVEDENO
Methodical Council
KPI them. Igor Sikorsky
protocol No 5 dd 23.02.2023

F – CATALOGUE
ELECTIVE ACADEMIC DISCIPLINES

for applicants for a bachelor's degree
speciality: 131 - Applied Mechanics
educational and professional program: Mechanical engineering technologies
for the 2023/2024 academic year

APPROVED:

Academic Council of NN MMI
KPI them. Igor Sikorsky
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According to Section X of Article 62 of the Law of Ukraine "On Higher Education" (No. 1556-VII of 01.07.2014), Elective disciplines are disciplines of free choice of students for a certain level of higher education, aimed at ensuring general and special (professional) competencies in the specialty. The volume of elective disciplines is at least 25% of the total number of ECTS credits provided for this level of education.

Students choose elective disciplines from the departmental F-Catalog in accordance with the "Regulations on the realization of the right to free choice of academic disciplines by applicants for higher education KPI. Igor Sikorsky".

The catalogue contains an annotated list of disciplines that are offered for selection by students of the first (bachelor's) level of VO according to the curriculum for the next academic year.

The choice of disciplines from the F-Catalog is carried out through the specialized information system of the University "my.kpi.ua". Generalized information is used to plan the educational process.

- **students of the II year** – choose disciplines for the third year of preparation;
- **III year students** choose disciplines for the **IV** year of preparation;
- **I and II year students enrolled in the abbreviated Bachelor's program** choose the discipline according to their curriculum.

Some disciplines are offered for students of certain faculties to study. For some disciplines, there is a limit in the number of students to whom it can be offered. In these cases, after the name of the discipline, the target audience (for students ...) or the number of places (up to ... students). In the process of choosing a discipline, please take these features into account.

All aspects of the realization of the right of students to choose disciplines can be found in the "Regulations on the procedure for exercising the right to free choice of academic disciplines by applicants for higher education KPI. Igor Sikorsky" https://osvita.kpi.ua/node/185

If it is impossible to form study groups to study a certain discipline of the normative number, students are given the opportunity to make a second choice by joining the already formed study groups.

It is not allowed to change the selected disciplines after the start of the academic semester in which they are taught.

Content

Educational component 1 F-Catalog

Discipline	K1.1 :: Machine graphics
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge gained in the study of the disciplines "Informatics", "Linear algebra and analytical geometry"
What will be studied	SolidWorks three-dimensional modeling system
Why it is interesting/necessary to study	The student will get acquainted with the basic means and mathematical apparatus of three-dimensional graphics and its use in mechanical engineering technology; learn how to create 3D models of engineering objects and prepare engineering drawings using 3D CAD system SolidWorks
What you can learn (learning outcomes)	The following issues are considered: setting up the SolidWorks interface; work with sketches; tools for creating solids; basics of surface modeling; development of drawings of parts and assembly products; design of sheet metal parts; solving problems of theoretical mechanics and material resistance
How can you use the acquired knowledge and skills (competence)	To obtain fundamental knowledge, on the basis of which it is possible to successfully study the disciplines of design and technological direction, as well as to master new knowledge in the field of computer graphics and geometric modeling necessary in production and design activities.
Information support	A set of documentation (presentations / pdf-instructions for the user) and video materials, a computer class for practical work.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 1 F-Catalog

Discipline	К1.2 :: Basics of three-dimensional modeling
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge gained in the study of the disciplines "Informatics", "Linear algebra and analytical geometry"
What will be studied	Three-dimensional modeling system CATIA V5 / V6. Modules: Part, Assembly, Drawing, Generative Shape Design, Sheet Metal, Structure Design
Why it is interesting/necessary to study	The student will learn the basic concepts, tools and approaches to work in the computer-aided design system CATIA, which is a powerful tool for creating three-dimensional models of parts.
What you can learn (learning outcomes)	Study of the basic theoretical foundations on which machine graphics are based: geometric modeling (types of models, methods of constructing objects, internal representation of geometric models, matrix transformations); mathematical methods used for geometric modeling (approximation methods, basic concepts of graph theory), obtaining information about the distribution of machine graphics and its place in automatic design systems, existing systems and obtaining skills in working with one of the most common graphic editors for technical purposes
How can you use the acquired knowledge and skills (competence)	Create sketches and three-dimensional models of parts and assemblies, making the most of the capabilities of the CATIA toolkit; create drawings and photorealistic images of models in semi-automatic mode; model sheet metal structures, obtain their scans; import/export the geometry of parts; use surface modeling tools
Information support	A set of documentation (presentations / pdf-instructions for the user) and video materials, a computer class for practical work.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 1 F-Catalog

Discipline	К1.3 :: Polygonal modeling
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge gained in the study of the disciplines "Informatics", "Linear algebra and analytical geometry"
What will be studied	2D and 3D modeling modules of the ArtCAM system
Why it is interesting/necessary to study	ArtCAM makes it possible to create relief surfaces based on two-dimensional vector or raster graphic images, even a photograph of a sample can be taken as a basis. ArtCAM contains tools for modeling complex shapes and combining preserved reliefs.
What you can learn (learning outcomes)	Creation of 2D and 3D images in ArtCAM; Raster, vector, and emboss images; Creating a raster image; Creation of vectors; Creation of three-dimensional relief; Work with text on the example of constructing letters of constant height; Control of the window of three-dimensional view; Three-dimensional template; Color binding; Smoothing of the relief; Construction of curvilinear profiles; Rotation; Rotate; Combination of reliefs; Extrude; Working with textures in ArtCAM
How can you use the acquired knowledge and skills (competence)	Building models using three-dimensional templates; Construction of reliefs on curvilinear profiles; Creating a texture on the relief; Creating complex reliefs by bonding colors; Interactive relief editing; Modeling of jewelry; Create a relief from a scanned picture
Information support	Syllabus of the discipline, control tasks, textbooks, presentations of lectures
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component of the 2 F-Catalog

Discipline	К2.1 :: Theory of cutting
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	For successful study of the discipline, it is necessary to have competencies in the theory of deformation of structural materials in conditions of complex power loads, as well as knowledge of the structure of modern structural materials and the laws of their change under the influence of power and thermal loads.
What will be studied	Modern technological processes of machining machine parts in the world engineering industry are based on the preferential use of various types of cutting with blade and abrasive cutting tools.
Why it is interesting/necessary to study	The first part of the discipline studies the most important physical laws of interaction of the cutting tool with the surfaces of the workpiece being processed and the technological features of the implementation of modern types of cutting, which include the most universal types of cutting: first of all, the theory of turning, axial processing, milling and other types of blade cutting.
What you can learn (learning outcomes)	In the second part of the discipline, the theory of abrasive processing and all modern types of abrasive processing are studied, which provide surface treatment of various geometric shapes and high quality characteristics of the treated surface
How can you use the acquired knowledge and skills (competence)	The competencies that are acquired after studying the discipline are basic and necessary for the successful further study of technological disciplines, which, together with this discipline, form the basis of the qualification level of the bachelor.
Information support	Syllabus of the discipline, control tasks, textbooks, presentations of lectures
Form of classes	Lectures, practical work, laboratory classes
Semester control	Passed

Educational component of the 2 F-Catalog

Discipline	K2.2 :: Forming surfaces by cutting
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	To successfully study the discipline, it is necessary to have the competencies of forming basic geometric shapes, which are used to represent various designs of parts of modern engineering, as well as to have knowledge of the physical laws of contact interaction of solids in the process of forming the surfaces of machine parts.
What will be studied	The basic laws of the formation of a kinematic scheme of interaction between the workpiece and the tool, which can ensure the formation of a given geometric shape of a set of surfaces.
Why it is interesting/necessary to study	The main schemes of forming surfaces that are effective for various technical and organizational conditions of production and groups of modern machine tools: lathe machines, planing and extended machines, drilling, milling and grinding.
What you can learn (learning outcomes)	Features of kinematic shaping schemes on modern CNC machines and multipurpose machines.
How can you use the acquired knowledge and skills (competence)	Determination of the impact on the formation processes by cutting power and thermal factors. Determination of the main physical and technological factors that affect the characteristics of the surface quality of the workpiece and the duration of the laborcapacity of the main cutting tools used for forming by cutting.
Information support	Syllabus of the discipline, control tasks, textbooks, presentations of lectures
Form of classes	Lectures, practical work, laboratory classes
Semester control	Passed

Educational component of the 2 F-Catalog

Discipline	K2.3 :: Physics of cutting processes
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	To study the discipline, students must have a thorough knowledge of the following courses Technology of structural materials and materials science; Engineering and computer graphics; Mechanics of materials and structures
What will be studied	determination of rational cutting modes to obtain a given product quality; determination of cutting tools, machine tools and equipment, taking into account the regularity of the cutting process; increasing the performance of the cutting tool taking into account the physical phenomena that are formed during the cutting process.
Why it is interesting/necessary to study	The task of studying the discipline is that the student should know: main achievements in the field of cutting theory and special molding processes; materials that are used in the manufacture of the cutting part of the cutting tool; physical phenomena during cutting metals and the basic regularities of the processes of elastic-plastic deformation of the layer, which is cut off during its transformation into chips; the main features of cutting dynamics; Thermal phenomena during metal cutting
What you can learn (learning outcomes)	perform calculations of cutting forces and power; calculate cutting modes for different types of material processing by cutting from the conditions of rational operation of tools; be able to choose a lubricant and coolant for different types of machining; acquire the skills of conducting experimental research, and processing and analyzing the obtained data
How can you use the acquired knowledge and skills (competence)	The purpose of the discipline is to prepare the future design engineer in the field of metalworking, cutting materials, justification of rational cutting modes, design features, adjustment and use of metalworking machines in the design and manufacture of machine parts
Information support	Syllabus of the discipline, lecture notes, tasks for execution practical and laboratory work.
Form of classes	Lectures, practical work, laboratory classes
Semester control	Passed

Educational component 3 of the F-Catalog

Discipline	К3.1 :: Design and production of blanks
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	To study the discipline, students must have a thorough knowledge of the following courses Technology of structural materials and materials science; Engineering and computer graphics; Mechanics of materials and structures
What will be studied	Study: development of technological design of cast or stamped blanks; determination of the economic efficiency of the use of one or another method of manufacturing the workpiece; development of design documentation for the drawing of the part during the technological processing of the elements of the form and casting and equipping the stamped workpiece; performing engineering calculations of structural elements of blanks; basic methods of calculation and design of cast and stamped blanks.
Why it is interesting/necessary to study	The discipline is necessary to study the following disciplines: Cutting materials -1, 2. Forming surfaces by cutting. Engineering technology -1.2. Technological equipment -1.2. Equipment of machining workshops. Technological equipment in aircraft manufacturing. Robotization of technological processes. Functional-cost analysis of structures. Assembly processes in mechanical engineering.
What you can learn (learning outcomes)	Know the basic requirements (structural, technological and operational) for cast parts and castings, as for workpieces of parts and stamped blanks; properties of casting alloys (physico-chemical, casting, special) and steels and the basic principles of their choice for the production of blanks;
How can you use the acquired knowledge and skills (competence)	Be able to analyze the manufacturability of cast casting and stamped blanks; correctly assign the planes of the opok connector when receiving castings and stamps for stamped blanks according to the drawing of the part to select, calculate and assign accuracy standards, allowances for machining, molding and stamping bows); independently work with literature, technological documentation and standards, determine the type of production, the complexity of the workpiece and processing allowances; use computer media.
Information support	Literature: basic and additional; resources of information networks "Internet" for the study of the discipline.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 3 of the F-Catalog

Discipline	К3.2 :: Processing of composite and special materials
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	To study the discipline, students must have a thorough knowledge of the following courses Technology of structural materials and materials science; Engineering and computer graphics; Mechanics of materials and structures
What will be studied	Study: the main types of modern components of composite materials (KM), special materials (CM), their combination; physico-chemical processes, obtaining KM and manufacturing products from them, processing KM and CM on metal-cutting equipment.
Why it is interesting/necessary to study	The discipline is necessary to study the following disciplines: Cutting materials -2. Forming surfaces by cutting. Design and production of blanks. Equipment of machining workshops. Technological equipment in aircraft manufacturing. Robotization of technological processes. Functional-cost analysis of structures. Assembly processes in mechanical engineering.
What you can learn (learning outcomes)	Know the types and characteristics of modern KM and special materials SM; trends and directions of their development, applications in aviation and space technology, in mechanical engineering.
How can you use the acquired knowledge and skills (competence)	Be able to put into practice knowledge about modern KM and CM, the processes of obtaining them, analysis of their structures. Apply the knowledge gained about modern KM and CM for the selection of materials in specified operating conditions, the necessary reliability, manufacturability, efficiency, durability, environmental consequences of their use in the design of technological processes. Be able to use technical means of measurement and control for these materials and the processes of their production and the necessary production equipment.
Information support	Literature: basic and additional; resources of information networks "Internet" for the study of the discipline.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 3 of the F-Catalog

Discipline	К3.3 :: Procurement technologies
VO level	First (bachelor's)
Course, semester	3rd year 5 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	To study the discipline, students must have a thorough knowledge of the following courses Technology of structural materials and materials science; Engineering and computer graphics; Mechanics of materials and structures
What will be studied	The subject of the discipline are the basic rules for designing machine parts blanks, as well as methods and methods of their manufacture.
Why it is interesting/necessary to study	Mastering the principles of modern progressive methods and methods of manufacturing machine parts blanks, design methods, implementation of resource-saving, low-waste and waste-free technological processes, selection of equipment and equipment for their production
What you can learn (learning outcomes)	- according to the specified initial data and the drawing of the part, choose a rational method and method of manufacturing the workpiece; - calculate the size of the workpiece; - choose the permissible deviations for the manufacture of the workpiece; - assign technical requirements for manufacturing; - draw the workpiece; - make a route of the technological process of manufacturing the workpiece;
How can you use the acquired knowledge and skills (competence)	preparation of students for the implementation of sections related to the design of the workpiece details in the course design in the discipline "Technology of Mechanical Engineering" and the thesis; increasing the level of engineering training of students; instilling in students the skills of design design work; training and development of students conducting scientific, economic analysis in making decisions related to the design of blanks of machine parts
Information support	Literature: basic and additional; resources of information networks "Internet" for the study of the discipline.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 4 F-Catalog

Discipline	К4.1 :: Design and manufacturing technologies of parts from sheet materials
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge of CAD systems (SolidWorks) at the initial level, for the full development of the discipline in the future
What will be studied	This course will study: - Basic principles of construction of parts from sheet material by methods of bending and extraction. - Research on strength, fatigue, dynamics of parts. With the possibility of their further modernization to achieve the best modeling result. - Development of drawings according to different standards (GOST, ISO) - The study of various kinds of measuring tools for sheet material. - Development of equipment for bending parts. Development of the technological process of processing parts using bending and exhaust methods
Why it is interesting/necessary to study	In the process of learning, students will be able to learn new methods of constructing three-dimensional parts, analyze parts and see in real time how this or that part will behave under load and in dynamics. Methods for constructing composite materials will be considered.
What you can learn (learning outcomes)	According to the results of this course, students will be able to fully master the modeling of complex three-dimensional parts, which are built by bending and extraction, to fully learn all the subtleties of constructing drawings that they will need in the future. And to master the construction of a full-fledged technological process for industries that are whitewashed on the methods of bending and extracting parts.
How can you use the acquired knowledge and skills (competence)	The acquired knowledge of students at the end of this course will be aimed at designing parts by bending and extracting, and designing a technological process that they can use in the future.
Information support	Syllabus of the discipline, control tasks, textbooks, presentations of lectures
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 4 F-Catalog

Discipline	К4.2 :: Computer-aided design
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge of CAD systems (SolidWorks) at the initial level, for the full development of the discipline in the future.
What will be studied	This course will study: - Basic principles of construction of parts and assemblies. - Development of drawings according to different standards (GOST, ISO) - The study of various kinds of measuring tools. - Study of the methodology for constructing gears, sprocket pulleys and their assemblies in the Gerteg software module - Study of the module for CAE calculations SolidWorks Simulation. - Study of the module for gas and hydrodynamic calculations - SolidWorks Flow Simulation. - Design of complex parts by surface modeling methods. The basic principles of work in the PDM system are considered
Why it is interesting/necessary to study	In the process of learning, students will be able to learn new methods of constructing three-dimensional parts, analyze parts and see in real time how this or that part will behave under load and in dynamics. The methods of work of a group of students on one project will be considered.
What you can learn (learning outcomes)	According to the results of this course, students will be able to fully master the modeling of complex three-dimensional parts, fully learn all the subtleties of building drawings that they will need in the future.
How can you use the acquired knowledge and skills (competence)	The acquired knowledge of students at the end of this course will be aimed at designing parts in the future.
Information support	Lecture notes, a computer class for laboratory work, a laboratory for practical skills in using a measuring tool.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 4 F-Catalog

Discipline	K4.3 :: Fundamentals of macro programming
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the courses "Informatics", "Higher Mathematics", "Engineering and Computer Graphics"
What will be studied	The purpose of the discipline is to form students' abilities to develop their own computer programs for automating the solution of engineering problems;
Why it is interesting/necessary to study	- to solve with the help of computer equipment general technical and special problems of mechanical engineering technology; - independently solve the tasks using reference books
What you can learn (learning outcomes)	- use modern office software; - use the integrated software development environment; - to solve with the help of computer equipment general engineering and special problems of mechanical engineering; - use the appropriate software to automate calculations;
How can you use the acquired knowledge and skills (competence)	Automate the development of programs for general engineering and engineering purposes
Information support	Lecture notes, a computer class for laboratory work, a laboratory for practical skills in using a measuring tool.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 5 F-Catalog

Discipline	К5.1 :: General structure of aircraft and their units
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the disciplines "Mechanics of structures", "Machine parts and design bases", "Engineering and computer graphics"
What will be studied	This discipline is designed to provide students with basic knowledge in the field of aircraft construction: the composition and features of the formation of modern aviation structures, taking into account the conditions of their operation.
Why it is interesting/necessary to study	As a result of mastering the discipline, the applicant for higher education receives knowledge of the general principles of building structures of different classes of aircraft; methods for developing design documentation and building computer models using CAD systems
What you can learn (learning outcomes)	analyze technical tasks, search for prototypes and choose the most optimal methods for solving the design problem; determine the primary structure of the mechanical structure of the aircraft and the preliminary values of the rigid parameters of its elements; based on the final data on the details of the structure, develop technical documentation that meets the requirements of standards and other regulatory documents.
How can you use the acquired knowledge and skills (competence)	The purpose of the discipline is the acquisition by students of theoretical knowledge and practical experience on the peculiarities of the formation of modern aviation structures of units and systems, taking into account the operating conditions of the aircraft.
Information support	Educational and work programs of the discipline, textbook (workshop), lecture notes
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 5 F-Catalog

Discipline	К5.2 :: Design features of high-tech products of machine-building production
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the disciplines "Mechanics of structures", "Machine parts and design bases", "Engineering and computer graphics"
What will be studied	System and aviation system. Classification of aircraft. Basic elements and basic subsystems of the aviation system. Control systems. Ailerons. Steering wheel height and stabilizer. Steering wheel. Flaps. Wing mechanization. Autopilot.
Why it is interesting/necessary to study	As a result of mastering the course, the student will know: - scientific, design, technological and production bases for the creation of modern aircraft; - features of aircraft as complex high-tech technical systems; - basic structural elements and systems of aircraft;
What you can learn (learning outcomes)	The objectives of studying the discipline are students' mastery: the basic concepts and terminology of the aerospace industry; basics of aircraft design and their components; basics of engine design and functioning; principles of classification of modern aircraft; general characteristics and designs of aircraft, aircraft and rocket engines;
How can you use the acquired knowledge and skills (competence)	- independently work with educational, reference, and scientific and technical literature; - analyze scientific, industrial and other processes that are the basis for the development of aviation; - adapt to the content of other basic modules in further training courses
Information support	Educational and work programs of the discipline, textbook (workshop), lecture notes
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 5 F-Catalog

Discipline	К5.3 :: Design and design of aircraft
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the disciplines "Mechanics of structures", "Machine parts and design bases", "Engineering and computer graphics"
What will be studied	Gaining knowledge on the design schemes of aircraft and power units of the airframe; General questions on the basics of design and calculations of individual aircraft components and structures for strength
Why it is interesting/necessary to study	In combination with course and diploma design, as well as pre-diploma practice, the discipline provides practical mastering of the basics of designing and calculating aircraft structures.
What you can learn (learning outcomes)	- general principles of construction of structures of different classes of aircraft; - methods of designing aircraft - analyze technical tasks, search for prototypes and choose the most optimal methods for solving the design problem; - to carry out calculations of the main elements of aircraft
How can you use the acquired knowledge and skills (competence)	The knowledge acquired by students during the study of this discipline will be useful to them: in further production activities and in the implementation of course and diploma projects.
Information support	Educational and work programs of the discipline, textbook (workshop), lecture notes
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 6 F-Catalog

Discipline	K6.1 :: Microprocessor technology
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge gained in the study of the disciplines "Electrical Engineering and Electronics", "Higher Mathematics ", "Informatics"
What will be studied	- basic concepts about the elements of microprocessor technology, their functions, purpose and field of application; typical elements and nodes of microprocessor technology; - basic knowledge about the representation of data in the elements of the microprocessor system; the main types of operations performed with data; basics of programming microprocessors; - basic principles of the use of microprocessor systems in solving problems of optimization of technological processes of parts processing and assembly of products
Why it is interesting/necessary to study	The requirement of the modern level of development of technology is the possession of at least basic knowledge of the basic means of automation used in all areas of mechanical engineering.
What you can learn (learning outcomes)	The student will know the basic principles of microprocessor technology; get acquainted with typical microprocessor devices; typical engineering processes that are automated using microprocessor technology.
How can you use the acquired knowledge and skills (competence)	After reading the course, the student will be able to: - choose the right microprocessor components; - correctly combine microprocessor components; - properly operate microprocessor devices; - apply engineering methods of design and construction of microprocessor devices; use modern methods of debugging hardware and software of microprocessor devices.
Information support	Educational and work programs of the discipline, textbook (workshop), lecture notes
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 6 F-Catalog

Discipline	K6.2 :: Basics of automation hardware
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge of the disciplines "Electrical Engineering and Electronics", "Higher Mathematics ", "Informatics"
What will be studied	The subject of study are the basic principles of the functioning of automation hardware, namely: the basic principles of operation, the mathematical basis for the functioning of hardware, typical examples of automation of operations and engineering processes, the basics of hardware programming.
Why it is interesting/necessary to study	Automation hardware is a basic element of any complex technical system in mechanical engineering. The student must have knowledge of the course and acquire skills for competitive advantage in the labor market and successful employment.
What you can learn (learning outcomes)	- basic principles of operation of automation hardware; - typical hardware, their model of use; - characteristic processes of automation engineering; - basic principles of programming and debugging automation hardware.
How can you use the acquired knowledge and skills (competence)	- choose the right automation hardware; - correctly combine automation components; - properly operate hardware; - use engineering methods of designing and constructing automation hardware; - use modern methods of debugging hardware and software of automation hardware.
Information support	Educational and work programs of the discipline, lecture notes
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 6 F-Catalog

Discipline	К6.3 :: Fundamentals of microcontroller technology
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge gained in the study of the disciplines "Electrical Engineering and Electronics", "Higher Mathematics ", "Informatics"
What will be studied	The purpose of the discipline is to give an important amount of relevant technical knowledge and practical skills in the field of application of microcontroller technology for the management, control and diagnosis of production processes in mechanical engineering.
Why it is interesting/necessary to study	The discipline is an applied discipline that studies the basics of digital electronics, microprocessor control systems for technical objects and their diagnostics, in particular in metalworking.
What you can learn (learning outcomes)	– basic concepts about the elements of microprocessor technology, their functions, purpose and field of application; typical elements and nodes of microprocessor technology; – basic knowledge about the representation of data in the elements of the microprocessor system; the main types of operations performed with data; basics of programming microprocessors; – basic principles of the use of microprocessor systems in solving problems of optimization of technological processes of parts processing and assembly of products
How can you use the acquired knowledge and skills (competence)	Such important concepts as the basics of digital (discrete) electronics, the element base of microprocessor systems, means of pairing real objects with microcomputers, means of reproducing and transmitting information, etc. are considered.
Information support	Educational and work programs of the discipline, lecture notes
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 7 F-Catalog

Discipline	K7.1 :: Cutting tools
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge of general and professional training cycles, namely: "Higher Mathematics", " Linear Algebra and Analytical Geometry", "Informatics", "Engineering and Computer Graphics", " Mechanics of Materials and Structures "
What will be studied	- classification, purpose and principles of operation of standard tools - Geometric parameters of the cutting part of metal-cutting tools - The main dependencies and relationships between the geometry of cutting tools and their influence on the process of machining parts, on their accuracy, roughness and quality of the surface layer - characteristics of tool materials, rules for choosing tool material, impact on productivity and quality of processing - Profiling special tools - General principles of construction of tooling machines with numerical control and automatic lines
Why it is interesting/necessary to study	It is impossible to manufacture the part in accordance with the requirements without ensuring the optimal choice of cutting tools. The development of technological processes is associated with the expedient choice and creation of more advanced technological equipment, tools for tooling, mechanization and automation of production.
What you can learn (learning outcomes)	- solve problems related to the rational operation of cutting tools in different production conditions - it is reasonable to choose the necessary cutting tools from a set of standard ones, based on the specified quality requirements of parts and the conditions for their processing - design special shaped cutting tools
How can you use the acquired knowledge and skills (competence)	- independently work with literature, technical documentation and standards - to carry out instrumental support of technological processes: it is reasonable to choose the type of cutting tool for a given technological process, design the tool and properly operate it
Information support	Educational and work programs of the discipline, educational manual: electronic edition of URL http://campus.kpi.ua/tutor/index.php?mode=mob&show&irid=181058 Educational and methodical complex Google Class URL https://classroom.google.com/c/MTkxNTE3ODMxNDVa
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational component 7 F-Catalog

Discipline	К7.2 :: Cutting equioment
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge of general and professional training cycles, namely: "Higher Mathematics", " Linear Algebra and Analytical Geometry", "Informatics", "Engineering and Computer Graphics", " Mechanics of Materials and Structures "
What will be studied	- theory of forming surfaces of parts and cutting tools; - basic dependencies and relationships between the geometry of cutting tools and the geometry of the part, their influence on the process of machining parts, on their accuracy, roughness and quality of the surface layer; - selection, design and calculation of metal-cutting tools, both general and special purpose; - the use of cutting tools in automated production.
Why it is interesting/necessary to study	- The development of technological processes is associated with the expedient choice and creation of more advanced technological equipment, tools for tooling, mechanization and automation of production. It is reasonable to choose and design various designs of cutting tools for modern metalworking systems is a component of technological preparation of production.
What you can learn (learning outcomes)	- principles and algorithms for solving typical problems of tool formation using computers; - principles and algorithms for constructing modern instrumental systems; - methodological approaches, analytical methods of calculation, which are common and allow you to solve all issues of designing the tool in a complex; - to solve the issue of the use of cutting tools in automated production.
How can you use the acquired knowledge and skills (competence)	- use algorithms and results of calculations obtained on a computer in the field of instrumental support of technological processes; - It is reasonable to choose and design various designs of cutting tools for modern metalworking systems.
Information support	Educational and work programs of the discipline, educational manual: electronic edition of URL http://campus.kpi.ua/tutor/index.php?mode=mob&show&irid=181058 Educational and methodical complex Google Class URL:https://classroom.google.com/c/MTkxNTE3ODMxNDVa
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational component 7 F-Catalog

Discipline	К7.3 :: Means of forming machine parts from non-metallic materials
VO level	First (bachelor's)
Course, semester	3rd year 6 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Knowledge of the disciplines of general and professional training cycles, namely: "Higher Mathematics", " Linear Algebra and Analytical Geometry"
What will be studied	The purpose of the credit module is to form students' ability to effectively use CAD in the field of tool production and competently design various designs of cutting tools for modern metalworking systems.
Why it is interesting/necessary to study	- solve problems related to the rational operation of cutting tools in different production conditions; - it is reasonable to choose the necessary cutting tools from a set of standard ones, based on the specified quality requirements of parts and the conditions for their processing; - design shaped cutting tools.
What you can learn (learning outcomes)	- principles, methods and algorithms for solving typical problems of profiling a tool using CAD; - principles, methods and algorithms for constructing modern CAD; - methodological approaches, analytical methods of calculation, which are common and allow you to solve all issues of designing the tool in a complex; - to solve the issue of the use of cutting tools in automated production.
How can you use the acquired knowledge and skills (competence)	- design and calculate metal-cutting tools, both general and special purpose; - strictly formalize and define optimization criteria; - use algorithms and results of calculations obtained on CAD; - to solve the issues of forming the surfaces of tools; - design shaped cutting tools.
Information support	Syllabus of the discipline, presentations for the course, tasks for practical work.
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational component 8 F-Catalog

Discipline	К8.1 :: Fundamentals of scientific research
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of mathematics
What will be studied	Patterns and methodology of the scientific path of knowledge
Why it is interesting/necessary to study	Ability to see causes, trends, driving forces in a supposedly messy mixture of information and use this knowledge, which will allow you to manage or use processes, and not succumb to it
What you can learn (learning outcomes)	Obtaining skills in the formulation and formalization of a scientific problem ("Formalization of an applied scientific problem"; "Formation of a tree of goals"; "Ishikawa Diagram: Determining a Set of Factors"). Knowledge of classification, limitations and problems of optimization methods. Formulation and solution of optimization problems of some classes: linear, nonlinear and dynamic programming, network planning, multicriterial optimization and problems on Markov and absorbing chains.
How can you use the acquired knowledge and skills (competence)	Acquired knowledge and skills will be useful in further training in the study of courses related to mathematical modeling and optimization, when performing bachelor's and master's work. In addition, the ability to deal with problems with the help of scientific methodology will help to understand and solve them (problems) both in further work and in the social sphere (personal life).
Information support	Syllabus, lecture notes, guidelines for laboratory work, questions and tasks for the test
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 8 F-Catalog

Discipline	K8.2 :: Discrete Mathematics
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of mathematics
What will be studied	Discrete mathematics
Why it is interesting/necessary to study	The course of higher mathematics, which is based on the study of continuous and deterministic processes, is not enough to understand and apply modern methods of modeling, optimization and management of modern systems, most of which are discrete
What you can learn (learning outcomes)	knowledge: basic concepts and mathematical apparatus of mathematical logic, the theory of sets, graphs, algorithms, finite automata; Skills: solving problems from these sections of discrete mathematics, formalizing processes and objects of mechanical engineering technology to describe and model them by means of discrete mathematics.
How can you use the acquired knowledge and skills (competence)	Apply the apparatus of discrete mathematics for the formalization, modeling and optimization of both the processes of mechanical engineering technology and processes in other branches of science and technology; Understand the principles on which modern modeling and optimization systems are based, be able to formalize the task for their proper use. This is necessary for the effective use of modern software systems and machines, many of which have built-in modeling and optimization systems.
Information support	Syllabus, lecture notes, guidelines for laboratory work, questions and tasks for the test
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 8 F-Catalog

Discipline	К8.3 :: Basics of experimental research
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of mathematics
What will be studied	The purpose of studying the discipline is to form students' abilities for systemic formulation in solving applied problems and the correct application of the methods of mathematical statistics and the theory of experiment planning to solve engineering problems.
Why it is interesting/necessary to study	The following will be studied: basic concepts of mathematical statistics; theory of experiment planning; multivariate regression analysis;
What you can learn (learning outcomes)	– formalization in the system formulation (multivariate and multi-criteria) of applied problems that arise in the technology of mechanical engineering; – planning a research experiment in order to obtain maximum reliable information with restrictions on resources; – carrying out multicriterial compromise optimization; – semantic analysis and interpretation of the results; – clearly, clearly and reasonably state scientific information and its conclusions;
How can you use the acquired knowledge and skills (competence)	solving research problems in mechanical engineering technology using methods of mathematical statistics and the theory of experiment planning; preparation of a scientific and technical report on the results of research.
Information support	Syllabus, lecture notes, guidelines for laboratory work, questions and tasks for the test
Form of classes	Lectures, practical classes
Semester control	Passed

Educational Component 9 F-Catalog

Discipline	К9.1 :: Heat treatment and coatings
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Laser technology and physical and technical technologies
Requirements for the beginning of the study	Based on knowledge of engineering and computer graphics, General physics, chemistry and materials science.
What will be studied	Features of thermal, chemical-thermal methods of material processing, coating using highly concentrated energy flows and electrochemical coatings, physical and physico-chemical processes of changing surface properties during electroerosive, electrochemical, ultrasonic, electron beam, laser, plasma and combined methods of material processing, technological operations and modes of their execution, technological characteristics of processes, working environments, tools and Equipment.
Why it is interesting/necessary to study	The discipline is the basis for mastering the physical essence of processes, methods of their management, technological characteristics and equipment, designing rational and economical technological processes, designing new machines and devices, etc.
What you can learn (learning outcomes)	As a result of studying the discipline, the student will learn to solve systems of typical tasks of activity to perform production functions.
How can you use the acquired knowledge and skills (competence)	The acquired knowledge and skills will enable future specialists to determine the technological characteristics of the processes of processing materials and coating using thermal, chemical-thermal, electrical, electrochemical, acoustic, chemical and combined methods, as well as technological processes. that alter the structure, condition and properties of the surface, using highly concentrated energy flows, electrical discharge, anode saturation, ultrasonic frequency fluctuations or their combined action.
Information support	Syllabus, textbook, presentations for the course, guidelines for the implementation of laboratory work.
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational Component 9 F-Catalog

Discipline	K9.2 :: Electrophysical and electrochemical processing methods
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Laser technology and physical and technical technologies
Requirements for the beginning of the study	Based on knowledge of engineering and computer graphics, General physics, chemistry and materials science.
What will be studied	Features of electrophysical and electrochemical methods of material processing, physical and physico-chemical processes in electroerosive, electrochemical, ultrasonic, electron beam, laser, plasma and combined methods of material processing, technological operations and modes of their execution, technological characteristics of processes, working environments, tools and equipment.
Why it is interesting/necessary to study	The discipline is the basis for mastering the physical essence of processes, methods of controlling them, technological characteristics and equipment, designing rational and economical technological processes, designing new machines, devices, etc.
What you can learn (learning outcomes)	As a result of studying the discipline, the student will learn to solve systems of typical tasks of activity to perform production functions.
How can you use the acquired knowledge and skills (competence)	The acquired knowledge and skills will enable future specialists to determine the technological characteristics of the processes of material processing using electrical discharge, highly concentrated energy flows, anode dissolution, oscillations of ultrasonic frequency or their combined action.
Information support	Syllabus, textbook, presentations for the course, guidelines for the implementation of laboratory work.
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational Component 9 F-Catalog

Discipline	K9.3 :: Physical Foundations of Laser Material Processing
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Laser technology and physical and technical technologies
Requirements for the beginning of the study	Basic knowledge of mathematics and physics
What will be studied	Physical processes that take place when using laser radiation as a technological tool. Special problems of the theory of thermal conductivity, melting and evaporation, models of laser destruction are studied in detail. The processes of laser cutting by continuous and pulsed-periodic radiation, parameters of gas laser cutting, the influence of energy, optical and gas-dynamic parameters on laser cutting processes are considered separately.
Why it is interesting/necessary to study	The discipline "Physical foundations of laser processing of materials" is basic for all technological courses in the educational and professional program "Laser technology and computerized processes of physical and technical processing of materials". Without the knowledge gained in this course, the student can not hope for his own further professionalism
What you can learn (learning outcomes)	Calculate and measure the parameters of technological processes of interaction of radiation with matter; calculate the temperature of the metal under the action of a laser heat source at a given point and at a given time, depending on the type of thermal problem, estimate the power density critical for phase transitions, calculate the parameters of destruction under the action of laser radiation, calculate the parameters of laser cutting of metals by continuous and pulse-periodic radiation, calculate the optimal energy, optical and gas-dynamic parameters of laser cutting
How can you use the acquired knowledge and skills (competence)	Ability to apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products. Ability to apply modern methods for the development of low-waste, energy-saving and environmentally friendly engineering technologies that ensure the safety of human life and their protection from the possible consequences of accidents, disasters and natural disasters, to apply methods of rational use of raw materials, energy and other types of resources in mechanical engineering
Information support	Syllabus, textbook, presentations for the course, guidelines for the implementation of laboratory work.
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational component of the 10 F-Catalog

Discipline	К10.1 :: Robotization of technological processes
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of theoretical mechanics, mechanical engineering technology, machine parts, theory of mechanisms and machines
What will be studied	Industrial robotics, technological processes for the manufacture of machine and instrument making products in the conditions of robotic production
Why it is interesting/necessary to study	The importance of the use of industrial robots in various sectors of the national economy, especially in mechanical engineering, is difficult to overestimate. The current stage of industrial and economic development of Ukraine is largely determined by the technological level of mechanical engineering, the use of industrial robots in various fields of production and the degree of introduction of robotic technologies.
What you can learn (learning outcomes)	- understanding of the main aspects and specifics of the use of industrial robots in mechanical engineering; - knowledge of the basics of industrial robotics; - knowledge of the basic capabilities of industrial robots.
How can you use the acquired knowledge and skills (competence)	The knowledge acquired by students during the study of this discipline will be useful to them: - in further production activities; - when performing course and diploma projects; - for the best assimilation of materials of the disciplines "Assembly processes in mechanical engineering", "Technological bases of flexible automated production", "Design of computer-aided production" and other special disciplines.
Information support	Syllabus, lecture notes, lecture presentations.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component of the 10 F-Catalog

Discipline	К10.2 :: System analysis
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	based on the following disciplines: higher mathematics; special sections of mathematics, computer science
What will be studied	The purpose of teaching the discipline is the assimilation by students of theoretical knowledge of system analysis of systems as a methodological basis for the analysis and modeling of complex technical systems.
Why it is interesting/necessary to study	Have knowledge of systems theory; modeling of complexhierarchical systems; signs of classification of systems and models of systems in terms of their research as objects of computerization; characteristics and basic properties of complexhierarchical systems. Master the ability to: decomposition, analysis and synthesis of systems; collect and systematize data on the object and its activities; application of a systematic approach
What you can learn (learning outcomes)	Basic concepts of system analysis and systems Modeling in system analysis Hierarchy analysis method Methods of the tree of goals, functional analysis
How can you use the acquired knowledge and skills (competence)	Mastering knowledge of system analysis will allow the student to implement the tasks of automating information processing, automating the control of objects and processes, using computer equipment.
Information support	Syllabus, lecture notes, lecture presentations.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component of the 10 F-Catalog

Discipline	К10.3 :: Control systems for technological equipment
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the courses "Technology of mechanical engineering"
What will be studied	the main dependencies that arise when performing solid waste for robotic complexes; design of route and operational TP using trajectory optimization methods of working and idle movements; development of technical documentation for route and operational TP; implementation of measures to improve the accuracy and productivity of processing, reduce the complexity of TP design and programming
Why it is interesting/necessary to study	Numerical control systems; Constructive and technological features of robotic complexes; Algorithmic support of robotic complexes; Methods of designing route TP; Composition and requirements for technological equipment of robotic complexes.
What you can learn (learning outcomes)	Correctly substantiate and develop TP for robotic complexes; Programming, coding and recording control software skills
How can you use the acquired knowledge and skills (competence)	The knowledge acquired by students during the study of this discipline will be useful to them: in further production activities and in the implementation of course and diploma projects.
Information support	Syllabus, lecture notes, lecture presentations.
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 11 F-Catalog

Discipline	К11.1 :: Assembly processes in mechanical engineering
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the courses "Technology of mechanical engineering", "Machine parts and basics of design", "Metrology, standardization and certification"
What will be studied	Basic information on technological preparation of aircraft and engineering production; types of production and organizational forms of machine assembly; structure of the technological process and accompanying documentation; rationing of assembly work; basic operations of preparing parts for assembly; method of assembly of detachable and non-detachable connections; method of assembling threaded, pressing, plastic-deformed connections, joints by soldering, glue, welding; assembly of typical components of machines and mechanisms; analysis of the accuracy of the assembly process
Why it is interesting/necessary to study	A modern specialist in the technology of aviation and mechanical engineering should know, in addition to various methods of processing parts and designing blanks, approaches to the design of product assembly technology, features of technological preparation of assembly production and equipment, devices and tools used in assembly work.
What you can learn (learning outcomes)	- design a 3D model of the assembly product; - perform dimensional analysis of the assembly unit; - to establish by methods of complete and incomplete interchangeability tolerances and limiting deviations of the linear dimensions of parts included in the assembly unit; - develop a drawing of the assembly unit; - develop a scheme and route technological process for assembling the product; - calculate the conditions for the formation of a compound; - choose a tool and device for implementing the connection; - normalize the technological process;
How can you use the acquired knowledge and skills (competence)	to study the features of technological preparation of aircraft and engineering production in terms of designing assembly technology, in order to further independently apply the knowledge gained in production conditions for the correct design of assembly processes
Information support	Syllabus , Lecture notes, presentations, video materials
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 11 F-Catalog

Discipline	K11.2 :: Automation of technological processes
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the courses "Technology of mechanical engineering", "Machine parts and basics of design", "Metrology, standardization and certification"
What will be studied	familiarization with the basic concepts of automation and automatic control systems; study of typical elements and systems of automatic control, their parameters and characteristics, general principles of construction, functioning, purpose and use and familiarization with the methods of their analysis, synthesis and correction; familiarization with modern solutions in the field of automation of technological processes
Why it is interesting/necessary to study	The purpose of the discipline is to form the necessary level of theoretical and practical training of students for their competent use of knowledge of the basics of automation and automatic control systems in the development of related disciplines and in future professional activities, which require theoretical knowledge and practical skills in the use of computer engineering and computer-integrated technologies to solve applied problems in various production and technological processes.
What you can learn (learning outcomes)	to analyze technological processes and, based on its results, to compile mathematical models of control objects and systems of their automation; reasonably choose the technical means of automatic control systems
How can you use the acquired knowledge and skills (competence)	The knowledge acquired by students during the study of this discipline will be useful to them: in further production activities and in the implementation of course and diploma projects.
Information support	Syllabus , Lecture notes, presentations, video materials
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 11 F-Catalog

Discipline	К11.3 :: Equipment for automated production
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of the courses "Technology of mechanical engineering", "Machine parts and basics of design", "Metrology, standardization and certification"
What will be studied	The purpose of the discipline is to study the structures of devices and the principles of choosing standardized and developing simple special technological equipment, so that in the future independently in production conditions technically competently and effectively solve the problem of equipping machining operations with progressive technological equipment.
Why it is interesting/necessary to study	The student will receive the knowledge to justify and choose a standard system of technological equipment, effective in specified production conditions; develop the design of a simple special device; use standards and standards in the synthesis of equipment structures; assess the basing errors and ways to reduce them; create a device layout
What you can learn (learning outcomes)	basic laws of the theory of basing blanks and products in devices; rules and procedure for choosing technological equipment and methods of its development; methods of choosing the appropriate design option for equipment from a number of alternative options; methods of economic justification of the expediency of the selected or developed equipment design; master modern methods of equipment development in accordance with the set technological, organizational and other production tasks; knowledge of methods for assessing the permissible values of errors in the installation of blanks or products in devices
How can you use the acquired knowledge and skills (competence)	The knowledge acquired by students during the study of this discipline will be useful to them: in further production activities and in the implementation of course and diploma projects.
Information support	Syllabus , Lecture notes, presentations, video materials
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component of the 12 F-Catalog

Discipline	K12.1 :: CNC machines and equipment
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	General knowledge of the disciplines: Higher Mathematics, Engineering and Computer Graphics, Chemistry, General Physics, Theoretical Mechanics, Technology of Structural Materials, Informatics, Materials Science, Mechanics of Materials and Structures, Theory of Mechanisms and Machines, Metrology, Standardization and Certification, Technology of Mechanical Engineering.
What will be studied	Technical and economic indicators and performance criteria. The main components and mechanisms of machine tools. Machine control, tools for control, diagnostics and adaptive control of machine tools. Purpose, layout, functionality, features of machine tool designs: lathe machines; milling and multipurpose machines for processing body parts; drilling and boring machines; extended machines; machines with electrophysical and electrochemical processing methods; machines for abrasive processing; gear processing machines for processing gears. Automatic lines; flexible production systems. Equipment for tool production. Fundamentals of metrological support of production. Reproduction of units of physical quantities and the transfer of their sizes. Measurement of physical quantities and processing of measurement results. Measuring instruments, their characteristics. Metrological service of the enterprise, its tasks and functions.
Why it is interesting/necessary to study	A mechanical engineer should know the main types of modern metal-cutting machines and equipment, their designs, purpose, technological capabilities, development trends and methods of designing components. The manufacture of parts on miles requires the appropriate implementation of measures for metrological support of production.
What you can learn (learning outcomes)	To be able to choose the necessary equipment for the specified conditions of production, taking into account its technological capabilities and economic feasibility, to calculate the structural elements and parameters of setting up metal-cutting machines. Be able to choose the right means, methods and methods of measurement, perform calculations of measurement errors to achieve a given accuracy.
How can you use the acquired knowledge and skills (competence)	The study of the discipline will allow to perform an analysis of the principle of operation and structures of components and mechanisms, which is the basis for the selection, calculation, maintenance and operation of machine and robotic equipment. As a result of studying the discipline, students receive knowledge on the design of new equipment and the assessment of performance indicators of existing equipment. The acquired knowledge will allow students to solve the problems of metrological support of machine-building production. Use information technology tools in the tasks of technical preparation of production.
Information support	Syllabus, control tasks, textbooks, lecture presentations
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component of the 12 F-Catalog

Discipline	K12.2 :: Technological equipment in aircraft industry
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	General knowledge of the disciplines: Higher Mathematics, Engineering and Computer Graphics, Chemistry, General Physics, Theoretical Mechanics, Technology of Structural Materials, Informatics, Materials Science, Mechanics of Materials and Structures, Theory of Mechanisms and Machines, Metrology, Standardization and Certification, Technology of Mechanical Engineering.
What will be studied	Classification of machines, their characteristics and performance indicators. Forming surfaces on machine tools. The main components and mechanisms of machine tools. Lathe machines; milling machines; drilling machine tools; grinding group machines; long, pre-slicing, planing machines; machines with electrophysical and electrochemical processing methods; Machines with numerical control, automatic lines; flexible production systems. Reproduction of units of physical quantities and the transfer of their sizes. Measurement of physical quantities and processing of measurement results Means of measurement and control in tool production.
Why it is interesting/necessary to study	In the practical activity of an engineer, tasks constantly arise for choosing productive, reliable and economical technological equipment, as well as means of measuring physical quantities. A mechanical engineer should know the main types of modern metal-cutting machines and equipment, their designs, purpose, technological capabilities, development trends and methods of designing components.
What you can learn (learning outcomes)	Know the classification of machines, their technical and economic indicators, molding on machine tools, the main components and mechanisms of metal-cutting machines, machine control. Perform an analysis of the layout, structural kinematic schemes, dimensions of the working space, technological capabilities of machines of different groups. Choose the right measuring instruments and measurement methods. Be able to assess the accuracy of the results obtained and, if necessary, develop ways to achieve a given accuracy.
How can you use the acquired knowledge and skills (competence)	To solve issues on the design and operation of machine equipment, including the adjustment of machines, checking their geometric accuracy, repair and maintenance of machines. Be able to choose equipment, tools and other means of technological equipment and automation for the implementation of production and technological processes. Know the principle of operation and features of the use of measuring instruments, methods and techniques for performing measurements and control. Develop and implement measures to ensure the quality of engineering products.
Information support	Syllabus, control tasks, textbooks, lecture presentations
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component of the 12 F-Catalog

Discipline	К12.3 :: Automated production equipment
VO level	First (bachelor's)
Course, semester	4th year 7 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	Basic knowledge of general and professional cycles Training
What will be studied	basic information about automatic machines and their use for the manufacture of machine parts in the conditions of mass production, as well as about CNC machines and their capabilities in modern engineering using modern programming systems, tooling
Why it is interesting/necessary to study	The main reason: a modern designer should have universal training, especially given the spread of small and medium-sized businesses, in which an engineer must solve a variety of current issues that may relate to different areas of knowledge, since the number of administrative and technical workers in such enterprises is limited.
What you can learn (learning outcomes)	understand the principles of the structure of modern machines used for various types of processing; To study the design features of these machines and their capabilities, which will allow to operate these machines with maximum productivity and quality of manufactured parts; Ability to understand the principles of building programming systems and their capabilities.
How can you use the acquired knowledge and skills (competence)	use reference books and computer media about the features of machines from different manufacturers; Perform a comparative analysis of various designs of automated machines in order to select the most progressive and economical for the implementation of a given technological process using reliable vehicles.
Information support	Syllabus, manuals, guidelines for laboratory / practical work, lecture notes
Form of classes	Lectures, practical classes
Semester control	Passed

Educational component 13 F-Catalog

Discipline	**К13.1 :: Fundamentals of algorithmic programming of CAD systems**
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	General scientific knowledge of mathematics and physics courses, computer science.
What will be studied	The basics of software configuration of CAD systems, the use of Autodesk Inventor API to create your own library modules designed to automate constructions in CAD systems will be studied.
Why it is interesting/necessary to study	An integrated development environment in CAD systems provides an opportunity to acquire knowledge and programming skills. And also there is an opportunity to use not only to improve the existing product tools, but also to create completely new ones. Also automate repetitive, time-consuming build operations in CAD systems and expand the basic functionality directly in the CAD program environment. API (application programming interface) and can be used to create your own tools and functions that connect directly to CAD, expanding its functionality.
What you can learn (learning outcomes)	Allows you to learn how to develop on VB.NET, C# parts of programs that the API uses. You will be able to libraries in CAD systems for automation of design and technological preparation of production
How can you use the acquired knowledge and skills (competence)	The course allows you to acquire knowledge and skills for an integrated development environment in CAD systems. Allows you to create a tool for managing the visibility of groups of assembly components in CAD. Create a new and user-friendly interface for CAD for the developed modules.
Information support	Syllabus, control tasks, lecture presentations
Form of classes	Syllabus, presentations of lectures, guidelines for practical work
Semester control	Passed

Educational component 13 F-Catalog

Discipline	K13.2 :: Designing Dies and Molds
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	based on the following disciplines: Higher Mathematics; Technology of structural materials; Descriptive geometry and engineering graphics; Machine parts and design basics
What will be studied	Design of dies and molds used in the production of parts and semi-finished products by polymer casting
Why it is interesting/necessary to study	Today's challenges require a new enterprising, creative person who will be able to independently assimilate information about the design and use of designing dies and molds for polymer casting methods
What you can learn (learning outcomes)	main achievements in the field of design of dies and molds; existing technological processes for the production of parts by polymer casting methods; existing methods for solving formation problems;
How can you use the acquired knowledge and skills (competence)	use reference books and computer media; analytically and numerically present the processes of production of parts by methods of casting polymers; calculate and develop the technological process and highlight its features for the design of a stamp or mold;
Information support	Syllabus, control tasks, lecture presentations
Form of classes	Syllabus, presentations of lectures, guidelines for practical work
Semester control	Passed

Educational component 13 F-Catalog

Discipline	K13.3 :: Rapid prototyping technologies
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	based on the following disciplines: Higher Mathematics; Technology of structural materials; Descriptive geometry and engineering graphics; Machine parts and design basics
What will be studied	The main technologies of rapid prototyping of prototyping of parts and products will be studied to study their functional, aesthetic, tactile properties. Such rapid prototyping methods are additive manufacturing and machining technologies on CNC machines
Why it is interesting/necessary to study	Modern technologies of rapid prototyping allow very quickly to obtain either a functional object or a ready-made prototype at the stages of product development. Such objects serve for visual and tactile perception of the product, which is still at the stage of development. Prototyping can significantly reduce the time and cost of developing a product and launching it on the market.
What you can learn (learning outcomes)	The subject of study of the discipline is the theoretical and practical foundations of rapid prototyping of the product, which includes basic data on: - creation of functional and visual prototypes; - selection of technology and stages of prototype; - 3D printing technologies used for rapid prototyping; - processing technologies on CNC milling machines when creating prototypes; - processing technologies on CNC contouring machines when creating prototypes; - technologies for creating prototypes from sheet material; - technologies for creating equipment for rapid prototyping; - methods and methods of proving prototypes and giving them special properties; - creation of CAD models of prototypes.
How can you use the acquired knowledge and skills (competence)	Thanks to the study of the discipline "Rapid Prototyping Technologies", it is possible to create prototypes to assess the ergonomics, design, functionality of new products, create special technological equipment and save significant time and money when launching a new product on the market both at the development stages and at the stages of production preparation.
Information support	Syllabus, lecture presentations, guidelines for practical and laboratory work
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational component of the 14 F-Catalog

Discipline	К14.1 :: Theoretical foundations of surface formation
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	is based on the following disciplines: Engineering and computer graphics; Higher mathematics; Theoretical mechanics; Technology of mechanical engineering
What will be studied	Theory, methods, methods for obtaining specified surfaces during machining
Why it is interesting/necessary to study	You will be able to determine the output of tool surfaces that limit the working forming surfaces of tools designed to process the specified surfaces of machine parts. - determine the conditions of formation, compliance with which ensures the processing of a given surface of the part in accordance with the drawing; - definition of a set of types of tools designed to process a given surface of a part. - get knowledge, theoretical information how in CAM systems determine the trajectory of the tool
What you can learn (learning outcomes)	- existing methods for determining the original tool surface, which is conjugated with the surface of the part; - existing methods for determining the treated surface of the part with known output tool surface and processing scheme; - existing methods for determining the kinematic scheme of processing by a well-known tool of the surface of the part.
How can you use the acquired knowledge and skills (competence)	- according to existing methods and algorithms to solve problems of determining possible processes of forming a given surface of a part; - determine the parameters of the formation process, ensuring the processing of a given surface in accordance with the drawing
Information support	Syllabus, lecture presentations, lecture notes, guidelines for practical work
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational component of the 14 F-Catalog

Discipline	K14.2 :: Gear manufacturing technology
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	It is based on the following disciplines: Engineering and computer graphics; Higher mathematics; Technology of mechanical engineering
What will be studied	The technology of manufacturing the main elements of the gear crown, as well as the design of tools to ensure their manufacture will be studied.
Why it is interesting/necessary to study	Gears are the main elements of the mechanisms for transmitting rotational motion, the surface of the crown of the gear wheel is a complex surface of periodic shape, therefore, the formation of the working surface of the gears has always been considered separately within the framework of the general technology of mechanical engineering, and the shape of the impeller surface of the wheel depends on the shape of the tool surface and therefore within the framework of this discipline not only the technology of forming gears is considered, but also the design of the forming tool.
What you can learn (learning outcomes)	The main methods of forming gears will be studied, namely cylindrical gears, conical straight-toothed gears, bevel wheels with a circular tooth and worm gears with line worms. The main methods of designing tools for such gears will also be studied.
How can you use the acquired knowledge and skills (competence)	To develop the technological process of processing gears and designing tools for their manufacture: -cylindrical gears, processing by dental and tooth-cutting with worm cutters; - conical straight-toothed gears by the method of processing with incisors; -conical wheels with a circular tooth by processing with a circular incisor head; - worm gears and features of their manufacture and design of tools for their manufacture.
Information support	Syllabus, control tasks, lecture presentations
Form of classes	Lectures, laboratory classes
Semester control	Passed

Educational component of the 14 F-Catalog

Discipline	К14.3 :: Tool production technology
VO level	First (bachelor's)
Course, semester	4th year 8 semester
Volume, and distribution of hours of classroom and independent work	4 ECTS credits / 120 hours. (audit. - 72, SRS - 48)
Language of teaching	Ukrainian
Pulpit	Mechanical engineering technologies
Requirements for the beginning of the study	It is based on the following disciplines: Engineering and computer graphics; Higher mathematics; Technology of mechanical engineering
What will be studied	The technology of tool production will be studied, namely the main processes for the manufacture of cutting tools, dies and molds
Why it is interesting/necessary to study	This will provide an opportunity in the formation of a set of professional knowledge, skills and abilities necessary for practical activities associated with a reasonable choice of the sequence of processing of various types of tools, solving engineering problems based on technological calculations aimed at creating modern cost-effective technological processes within modern specialized tool industries.
What you can learn (learning outcomes)	- Features of the technology of manufacturing tools. - Instrumental materials and their features. - Selection of blanks of cutting tools. - Treatment of base surfaces. - Heat treatment of tool materials. - Technological options for the manufacture of prefabricated one-piece and detachable tools. - Procurement stage of tool manufacturing technology. - Basic formative technologies. - Technology of tooth formation tool. - Shaping of chip grooves. - Grinding operations. - Sharpening the tool. - Backlogging. - Improving the performance of the cutting tool. - Manufacturing technologies for typical die tools and molds
How can you use the acquired knowledge and skills (competence)	To develop the technological process of processing cutting tools and dies and molds, to carry out a set of measures to restore the operability of the tool – sharpening. Assign a set of methods to improve the performance of tools, coating, strengthening the finish, etc.
Information support	Syllabus, presentations of lectures, guidelines for practical work
Form of classes	Lectures, laboratory classes
Semester control	Passed