Practical Grammar of the English Language	
Lecturer	*Valeriya Havrylenko*
Educational level	*First (Bachelor)*
Year of study	*2, 3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of theory, practice and translation of the English language*
Assumed knowledge and prerequisites	*B2 level of English*
The scope of course	*The aim of the course is to improve knowledge and understanding of the grammar structure of the modern English language, in particular – the peculiarities of parts of speech functioning in language. The course also envisages the practicing of application of various tense forms in active and in passive voices, changes of direct speech into indirect one and vice versa, the peculiarities of sequence of tenses, and the peculiarities of different moods usage. Special attention is paid to current tendencies and changes in English grammar, syntax and punctuation, as these are of a great importance in translation activity.*
Rationale	*These subject deepens and systematizes knowledge of English, being complementary in obtaining the skillset necessary for being a high quality translator or interpreter, as only deep understanding of the language's inner workings grants the ability to convey the translated messages, both oral and written, in a proper manner.*
Learning outcomes	*Learning outcomes:* - *Being able to analyze language units, define their interaction modes and characterize linguistic phenomena and processes, which define them;* - *Contrast different language and speech units with the view of finding key information in the original texts;* - *collect, analyze, systematize and interpret language and speech facts and use them accordingly in order to solve various difficult tasks in specific areas of professional activities and/or education.*
Competencies and skills	*This discipline ensures the acquisition of the following competencies:* - *ability to understand and use the principle of language organization, language's nature, its functions, levels and structural typology of the world's languages;* - *ability to apply sociolinguistic, lingvo-cultural and contrastive-and-typological analyses to language phenomena;*
Instructional materials: syllabus of the discipline, set of educational and curricular materials	
Mode of delivery: Seminars	
End of semester control: credit	

101 Environmental studies

Environmental Protection Organisation and Management	
Restrictions (specialty for which the course is offered)	*Environmental sciences*
Educational level	*Bachelor's degree*
Year of study	*3*
Number of ECTS credits	*6*
Language of study	*English*
Department	*Ecology and Plant Polymers Technology*
Assumed knowledge and prerequisites	*English*
Scope of the course	*The scope of the course includes theoretical foundations of management, the main directions of ecological policy of the state, international experience in environmental management.*
Rationale	*At the present stage, socio-economic development leads to increased anthropogenic impact on the environment, which reduces its ability to self-healing. In addition, there are clear signs of ecological crisis, which are manifested in the degradation of the environment. Therefore, it is important to find the optimal interaction between the environment and meet the basic needs of society. Taking into account the social, economic and environmental interests of society is ensured through the environmental policy of the state, which is implemented through the system of environmental management. The Department ensures the implementation of legislation, control over compliance with environmental safety requirements, carrying out comprehensive measures aimed at the rational use of natural resources, achieving coordination of actions of state and public bodies in the field of environmental protection.*
Learning outcomes	*Expected learning outcomes include:* *– knowledge of tools and mechanisms for environmental management at the local, regional, national and international levels, taking into account the program of sustainable development at all levels;* *– be able to assess the impact of basic environmental laws on management decisions;* *– to adapt international management experience in the practice of environmental activities of rational use of natural resources;* *– to define ecological problems of Ukraine and to solve them in the context of strategy of ecological policy of the state*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– Use the basic principles and composition of environmental management;* *– inform the public about the state of environmental safety and sustainable use of nature;* *– formulate requirements for personnel management and use in practice the principles of personnel selection management;* *– interact with participation in the management of environmental actions and / or environmental projects.*
Instructional Materials	*syllabus, learning materials (lecture notes, presentations, reference book)*
Mode of delivery	*lectures (seminars/workshops /tutorials)*
End-of-semester control	*Exam*

Inna Trus, associate professor, inna.trus.m@gmail.com

Meteorology and Climatology	
Restrictions (specialty for which the course is offered)	*Environmental sciences*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Ecology and Plant Polymers Technology*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes formation of students' full knowledge in physical, electrical and physico-chemical processes occurring in the atmosphere; learning the impact of these processes on the formation of meteorological phenomena; determination of anthropogenic effect on meteorological and climatic processes*
Rationale	*Atmospheric processes and meteorological phenomena are one of the most important environmental factors. Climate change and, as a result, catastrophic changes in the weather characteristics at different parts of our planet lead to awful destruction and human losses. Understanding the main atmospheric processes, their impact on weather and climatic characteristics is a necessary feature of the future specialist in ecology and environmental protection field.*
Learning outcomes	*Expected learning outcomes include:* *– ability to critically comprehend the basic theories, methods and principles of natural sciences*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– understand the basic environmental laws, rules and principles of environmental protection and nature management;* *– understand the basic concepts, theoretical and practical problems of natural sciences, which are necessary for analysis and decision-making in the ecology, environmental protection and rational nature management fields;* *– to improve the professional level by further education and self-education*
Instructional Materials	*syllabus, learning materials, presentations*
Mode of delivery	*lectures and seminars*
End-of-semester control	*Test*

Yaroslav Radovenchik, associate professor, r.yar@ukr.net

Toxicology	
Restrictions (specialty for which the course is offered)	*Environmental sciences*
Educational level	*First level (Bachelor's degree)*
Year of study	3
Number of ECTS credits	*5*
Language of study	English
Department	*Ecology and Plant Polymers Technology*
Assumed knowledge and prerequisites	*Toxicology course studying based on knowledge of biology, general ecology, inorganic, organic and analytical chemistry*
Scope of the course	*The main directions of toxicology, peculiarities of the various environment pollutants influence on living organisms and ecosystems as a whole*
Rationale	*Understanding the basics of toxicology becomes especially important for the period of intensification of anthropogenic pollution, because it allows you to manage environmental risks, avoid dangerous situations and poisonings. Toxicology provides critically important information and knowledge that can be used to make the balanced decisions about personal safety, homeostasis of natural ecosystems and to promote the concept of sustainable development in a global scale*
Learning outcomes	*To find out the impact of certain groups of pollutants on living organisms, to master the methods of toxicological calculations and to learn to assess the degree of toxicological risk.*
Competencies and skills	*After mastering the "Toxicology" discipline students will acquire competencies:* – *tracking the movement of xenobiotics in ecosystems along trophic chains;* – *assessment the toxicity degree of various substances and media;* – *determination of the class of toxicity and danger of chemical pollutants according to the parameters of toxicometry.*
Instructional Materials	*A course of lectures that can be taught remotely*
Mode of delivery	*Lectures, practical and laboratory classes*
End-of-semester control	*Exam*

Valeriya Vember, associate professor, vvember@gmail.com

Analytical Chemistry - I. Qualitative Analysis	
Restrictions (specialty for which the course is offered)	*Environmental sciences*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Ecology and Plant Polymers Technology*
Assumed knowledge and prerequisites	*English B2, Completion of educational component "Inorganic Chemistry", "Physics", "Mathematics"*
Scope of the course	*The scope of the course includes* *– basic laws of chemistry used in analytical chemistry;* *– logical connection between methods of analytical chemistry and chemical properties of molecules and ions;* *– general provisions of the basics of chemical methods of analysis;* *– extensive laboratory practice in qualitative chemical analysis of kations and anions.*
Rationale	*The educational component contributes to the development of professional expertise in principles and methods of chemical analysis, promoting the achievement of a more in-depth understanding of chemical processes and the laws of their course.*
Learning outcomes	*Expected learning outcomes include:* *– study of theoretical bases of chemical methods of analysis in the control of human objects and the environment;* *– scientific substantiation of general approaches in the selection and development of methods for determining the chemical composition of substances, their concentration, separation and identification.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– prepare necessary materials and reagents for analysis;* *– perform qualitative analysis of simple objects of man-made and natural origin;* *– perform calculations of analysis results.*
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures, laboratory practices*
End-of-semester control	*Exam*

Oleksandr Khokhotva, associate professor, khokhotva@bigmir.net

Analytical Chemistry - II. Quantitative Analysis	
Restrictions (specialty for which the course is offered)	*Environmental sciences*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Ecology and Plant Polymers Technology*
Assumed knowledge and prerequisites	*English B2, Completion of educational component "Inorganic Chemistry", "Physics", "Mathematics"*
Scope of the course	*The scope of the course includes* *– the theoretical foundations and practical skill in quantitative (gravimetric, titrimetric) chemical analysis;* *– acquaintance with the rules of work with chemical utensils and analytical scales;* *– study of preparation methods of compounds for analysis;* *– the basic principles of analytical research;* *– study of methods of analytical evaluation of analysis results.*
Rationale	*The educational component contributes to the development of professional expertise in the theoretical foundations of quantitative chemical analysis and mastering the practical skills of its implementation. The students will learn the theoretical basis of modern analytical chemistry, the main stages of analytical research, the features of different methods for determining chemical ingredients in the environment.*
Learning outcomes	*Expected learning outcomes include:* *– to run qualitative control in solving of environmental problems;* *– to perform quantitative analysis of simple objects of man-made and natural origin;* *– the ability to work with laboratory equipment.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– to perform quantitative analysis of simple objects of man-made and natural origin;* *– to perform calculations of the composition of the system, the amount of substance of the reacting compounds for the development of technological processes* *– the ability to work with laboratory equipment* *– using the theoretical provisions of analytical chemistry and reference data, calculate the necessary parameters (masses of substances, volumes of solutions, concentrations of components) for preparation of working solutions (titrants, buffers, indicators) for the purpose of their standardization;* *– to evaluate the possibilities of analysis methods and reasonably choose a method for a specific practical analysis;*
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures, laboratory practices*
End-of-semester control	*Exam*

Oleksandr Khokhotva, associate professor, khokhotva@bigmir.net

133 Industrial Machinery Engineering

Informatics	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Chemical, polymer and silicate mechanical engineering*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes: The student acquires basic knowledge of computer science, rules of computer work, basics programming; will be able to type, insert objects, build graphics, tables and charts in Word, Excel, PowerPoint editors; perform calculations and evaluate the results in software environments MathCAD, VBA, or similar*
Rationale	*The knowledge and skills gained in the classroom will make it easy to find an interesting job*
Learning outcomes	*Ability to apply standard analytical methods and computer software to solve engineering problems of industrial engineering, effective quantitative methods of mathematics, physics, engineering, as well as appropriate computer software for solving engineering problems of branch mechanical engineering*
Competencies and skills	*The ability of a person to solve complex specialized problems and practical problems in a particular field of professional activity or in the learning process, which involves the use of certain theories and methods of relevant sciences and is characterized by complexity and uncertainty of conditions* *.Carry out engineering calculations to solve complex problems and practical problems in the field of mechanical engineering*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and computer practicum*
End-of-semester control	*Test*

Heat Transfer	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Chemical, polymer and silicate mechanical engineering*
Assumed knowledge and prerequisites	*English B2, "Informatics", "Mathematics", "Physics", "Theoretical foundations of heat engineering"*
Scope of the course	*The subject of the discipline "Heat Transfer" - heat transfer processes in devices and apparatus of polymer and construction industries, calculations of the parameters of these processes.* *The solution of this problem is determined by the level of training of specialists working in the field of chemical engineering of chemical and construction industries. To successfully solve the problems of calculating heat transfer processes, specialists must be fluent in information, be able to solve the problem of heat transfer in industrial equipment.*
Rationale	*Most of the technological processes of enterprises for the production of building and polymeric materials are associated with heat transfer, and, in many cases, this operation is the final stage of technological processing, which determines the properties of materials and product quality. Rational choice of the mode of heat treatment and the corresponding heat exchange equipment is defined by technological and operational characteristics of materials and products, resource and energy saving, and also economic indicators of production.*
Learning outcomes	*-the ability of a person to solve complex specialized problems and practical problems in a particular field of professional activity or in the learning process, which involves the use of certain theories and methods of relevant sciences and is characterized by complexity and uncertainty of conditions.* *- ability to apply fundamental scientific facts, concepts, theories, principles to solve professional problems and practical problems of industrial engineering - ability to make effective decisions on the choice of construction materials, equipment, processes and combine theory and practice to solve engineering task.* *- ability to describe and classify a wide range of technical objects and processes, based on deep knowledge and understanding, knowledge of related technical sciences.*
Competencies and skills	*- knowledge and understanding of the principles of technological, basic and engineering sciences that underlie the branch engineering of the relevant industry;* *- perform engineering calculations to solve complex problems and practical problems in the field of mechanical engineering;* *- analyze engineering objects, processes and methods;* *- select and apply the necessary equipment, tools and methods;* *- apply technical control tools to assess the parameters of objects and processes in the field of mechanical engineering;* *- know and understand related fields (mechanics of liquids and gases, heat engineering, electrical engineering, electronics) and be able to identify interdisciplinary links at the level necessary to meet other requirements of the educational program.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Theoretical Foundations of Heat Technics	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Chemical, polymer and silicate mechanical engineering*
Assumed knowledge and prerequisites	*English B2, knowledge of mathematics, physics, thermal processes and equipment of chemical technologies, automated engineering systems. Is the basis for the study of the following courses of disciplines: "Processes, devices and machines of the industry", "Technological equipment for the production of construction and polymer products", "Technology of composite materials"*
Scope of the course	*The subject of the discipline - the basic laws of technical thermodynamics. Methods of research of energy phenomena in thermodynamics. Status parameters. Mathematical expressions of the laws of thermodynamics*
Rationale	*The "Theoretical foundations of heat technics" are general technical discipline, studying the methods of obtaining, heat conversion, transfer and use as well principles of operation and design features of heat and steam generators, heat engines and devices.*
Learning outcomes	*According to the requirements of the curriculum, students after mastering the credit module must demonstrate the following learning outcomes:* *knowledge of the basic laws of technical thermodynamics* *ability: using the basic principles and laws of thermodynamics to analyze the operation of heat engines and the processes that occur in them and identify ways to save heat resources.*
Competencies and skills	*ability to use the basic laws of thermodynamics in calculations and thermodynamic analysis of the efficiency of energy transformations in equipment.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Applied Numerical Methods	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Chemical, polymer and silicate mechanical engineering*
Assumed knowledge and prerequisites	*English B2,.physics, chemistry, higher mathematics, resistance of materials, materials science, engineering technology.*
Scope of the course	*The essence of numerical methods. Characteristics of numerical methods. Numerical methods for solving nonlinear equations. Numerical differentiation of functions. Finite difference method for solving differential equations*
Rationale	*The purpose of studying the credit module is to form in students a set of knowledge, skills, abilities necessary for qualified mastery of applied numerical methods for calculating machines and equipment of chemical plants.*
Learning outcomes	*Knowledge and understanding of the principles of technological, fundamental and engineering sciences that underlie the branch of mechanical engineering.* *Carry out engineering calculations to solve complex problems and practical problems in the field of mechanical engineering.* *Analyze engineering objects, processes and methods.* *Develop parts and assemblies of machines using computer-aided design systems.*
Competencies and skills	*Ability to use standard analytical methods and computer software to solve engineering problems of industrial engineering, effective quantitative methods of mathematics, physics, engineering, as well as appropriate computer software to solve engineering problems of industrial engineering.* *Ability to make effective decisions on the choice of construction materials, equipment, processes and combine theory and practice to solve engineering problems.* *Ability to use computer-aided design systems and specialized application software to solve engineering problems in the field of mechanical engineering.* *Ability to make effective decisions on the choice of construction materials, equipment, processes and combine theory and practice to solve engineering problems.* *Read, analyze, edit source code, compile programs for engineering calculations on a PC using a high-level algorithmic language*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and computer practicum*
End-of-semester control	*Test*

3D-graphics and printing	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Chemical, polymer and silicate mechanical engineering*
Assumed knowledge and prerequisites	*English B2, basic knowledge of the disciplines: "Informatics" "Engineering and computer graphics", "Engineering calculations on a PC"*
Scope of the course	*Principles of three-dimensional modeling. Sketches and geometry details. Three-dimensional operations with sketches. Adjust parts and assemblies settings. Creating conjugations between assembly elements. Three-dimensional orientation of assembly parts. Creating two-dimensional drawings from three-dimensional models of parts and assemblies. Work with dimensions, symbols and technical inscriptions on the drawing. 3D printing. Types and characteristics of basic 3D printers, their settings.*
Rationale	*Casses are aimed at providing modern, holistic knowledge in the field of computer design; providing creative work of students together with the teacher during the lecture; formation of students' necessary interest and providing direction for independent work; acquisition of visual information.*
Learning outcomes	*According to the requirements of the curriculum, students after mastering the credit module must demonstrate the following learning outcomes: knowledge of fundamentals of 3D modeling software, rules for building and editing 3D object models.*
Competencies and skills	*Use software to build 3D objects and 3D structures, set the properties of 3D objects, and perform motion simulations.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Design of Heat Exchange Equipment	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Machines and apparatus of chemical and oil refining industries*
Assumed knowledge and prerequisites	*English B2, Completion of educational component "Engineering and computer graphics", "Fundamentals of chemical engineering", "Automated engineering systems"*
Scope of the course	*The scope of the course includes: Features of designs of heat exchangers and main units. Methods of creating design documentation for design of heat exchange equipment using modern CAD systems. Special features of individual CAD-systems for the design of heat exchange equipment....*
Rationale	*Heat exchangers and other types of heat exchange equipment are a mandatory component of the vast majority of technological lines in the chemical industry and related industries, and in many cases the operation of heat exchange equipment significantly affects the efficiency of the plant as a whole. Therefore, ensuring the reliability of such equipment at the design stage is an important task of the industry. For the training of specialists capable of solving such problems, it is important not only to have a deep understanding of the design features of heat exchangers and their elements, but also experience with modern CAD-systems that increase the efficiency of the designer*
Learning outcomes	*- Knowledge of the typical designs of elements, parts and assemblies of heat exchangers, their classification, areas of application, and be able to make informed choices.* *- Understanding of the methods and have the skills to design standard heat exchange equipment, its components and elements in accordance with the task.* *- Knowledge of automated engineering systems and specialized software, including CAD / CAM / CAE-systems, for the development and design of heat exchange equipment*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– use computer-aided design systems and specialized application software to solve problems in chemical engineering.* *- develop plans and projects of heat exchange equipment, aimed at achieving the goal, taking into account the existing limitations, to solve problems of improving product quality and control.–*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Processes and Technologies of Primary Oil and Gas Refining

Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Machines and apparatus of chemical and oil refining industries*
Assumed knowledge and prerequisites	*English B2, Knowledge of mathematics, physics, processes and equipment of chemical technologies, automated engineering systems.*
Scope of the course	*The scope of the course includes: Origin, features of oil and gas exploration and production. Methods and methods of selection of equipment for primary oil and gas refining.*
Rationale	*In addition to the fact that Ukraine produces and processes a significant amount of oil and gas, in Kiev there are several dozen large design organizations for the design of enterprises from production to deep processing of oil and gas.*
Learning outcomes	*Knowledge of methods and techniques of extraction, transportation and refining of oil and gas.*
Competencies and skills	*Ability determine parameters chemical-technological processes and to make a rational choice of equipment for primary oil and gas refining, to determine the modes of its operation in the given production conditions.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Numerical Methods of Analysis	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Machines and apparatus of chemical and oil refining industries*
Assumed knowledge and prerequisites	*English B2, knowledge of mathematics and computer science.*
Scope of the course	*Methods of computational mathematics. Errors in the results of numerical solution of problems. Numerical of integrations. Numerical methods for solving nonlinear and transcendental equations. Approximation of functions. Interpolation. Point and integral quadratic approximation of functions.*
Rationale	*The activity of a modern engineer is inextricably linked with the use of a personal computer, which allows you to intensify the work of the engineer, to accelerate the results of calculations. Numerical methods for the engineer is a method of quantitative decision making, ie a method of quantitative optimization of engineering decisions.*
Learning outcomes	*- Numerical methods of analysis and application of computer technology when performing justification of decisions* *- Use numerical methods of computer applications technologies, CAD-systems and other applications to determine the main characteristics of the equipment, to choose the parameters and typical structural elements of the technological equipment of chemical engineering: chemical, oil refining and pulp and paper industries* *- Perform design calculations and justification of the accepted solutions with the use of computer technology, CAD-systems and other applications, including the use of numerical methods of analysis of chemical engineering equipment: chemical, oil refining and pulp and paper industries*
Competencies and skills	*- Ability to use numerical methods of analysis using computer technologies, CAD-systems and other applications when performing justification of decisions.* *- Ability to use knowledge of academic disciplines with calculation and modeling with the help of computer technologies, CAD systems and other applications when performing substantiation decisions and development, modernization and utilization of chemical engineering equipment: chemical, oil refining and pulp and paper industries.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Special Methods of Thermal Treatment	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Machines and apparatus of chemical and oil refining industries*
Assumed knowledge and prerequisites	*English B2, knowledge of mathematics, physics, thermal processes and equipment of chemical technologies, automated engineering systems..*
Scope of the course	*Methods and methods of selection of thermal energy generation by combustion method. Features of selection and calculation of various burners, types of furnace equipment, features of selection of furnace equipment.*
Rationale	*The knowledge and skills gained in the classroom will make it easy to find an interesting job*
Learning outcomes	*Knowledge of fuels, types of burners and various furnace equipment. Methods of their selection and operation*
Competencies and skills	*Use knowledge and skills in the calculation and selection of furnace equipment not only in industry but also in everyday life*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Chemical Engineering Thermodynamics	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Machines and apparatus of chemical and oil refining industries*
Assumed knowledge and prerequisites	*English B2, basic knowledge of the disciplines: "Fundamentals of Chemical Engineering", "Transfer processes in continuous media"*
Scope of the course	*Basic laws of thermodynamics and thermodynamic parameters. Thermodynamics of mixtures and solutions. Thermodynamic equilibrium. Thermodynamic analysis of processes*
Rationale	*Thermodynamics is a fundamental science that studies the general properties of macroscopic systems and methods of energy transfer and conversion in such systems, and is the basis of many practical applications in chemical engineering. In particular, knowledge of thermodynamics allows to develop the most rational methods of calculating heat balances during physical and chemical processes, to reveal the patterns observed in equilibrium, to determine the most favorable conditions for processes, identifies conditions under which all side processes can be minimized.*
Learning outcomes	*- Knowledge and understanding of the principles of thermodynamics that underlie the engineering of chemical equipment and related technologies.* *- Understanding of the physical nature of phenomena, mechanisms of thermodynamic processes occurring in the equipment of chemical and related technologies, use the mathematical apparatus for quantitative calculations, based on which to choose the parameters of equipment and modes of its operation.*
Competencies and skills	*Ability to use the basic laws of thermodynamics in calculations and thermodynamic analysis of the efficiency of energy transformations in equipment.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

Refrigeration Equipment	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Machines and apparatus of chemical and oil refining industries*
Assumed knowledge and prerequisites	*English B2, Knowledge of physics, thermodynamics, mathematics, mastering the discipline "Processes and equipment of chemical technologies"*
Scope of the course	*Constructions, methods of calculation and optimization of refrigeration machines and units. Modern technologies for obtaining cold. Ventilation and air conditioning systems.*
Rationale	*Refrigeration and air conditioning are widely used in chemical technology, so having the skills to design and operate it will provide a competitive advantage when working in the specialty.*
Learning outcomes	*- Carry out the selection and calculation of standard equipment and technological schemes for cooling systems.* *- To build algorithms for calculating refrigeration equipment according to selected process models, to use modern computer programs for modeling the operation of refrigeration equipment.*
Competencies and skills	*- Choose operating modes, design dimensions of equipment and heat or cold supply system.* *- Carry out design development of equipment.- Carry out a comprehensive experimental research equipment for receiving artificial cold.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

3D-enginering Methods	
Restrictions (specialty for which the course is offered)	*Industrial Machinery Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	
Number of ECTS credits	*4*
Language of study	*English*
Department	*Machines and apparatus of chemical and oil refining industries*
Assumed knowledge and prerequisites	*English B2, Basic knowledge of the disciplines "Physics", "Higher Mathematics", "Engineering and Computer Graphics"*
Scope of the course	*Basic methods of computer modeling of 3D-elements and assembly units, as well as simulation of mechanical, hydraulic, hydromechanical and thermal processes over them in SolidWorks.*
Rationale	*This discipline is very important for mechanical engineers and research engineers, as it forms the necessary set of skills and abilities to use SolidWorks software to create adequate working models of real equipment and implement simulation of chemical engineering processes.*
Learning outcomes	*- The main methods of software development for design and engineering work of chemical engineering: chemical, oil refining and pulp and paper industries.* *- Methods and approaches for design development of equipment and execution of drawings of chemical engineering equipment: equipment for chemical, oil refining and pulp and paper production and their components and parts using computer technology, CAD systems, CAD and other design applications*
Competencies and skills	*- Use computer technology, CAD-systems and other applications for design development of equipment and perform assembly drawings of machines and devices, their components and parts of chemical engineering equipment.* *- Use of computer technologies, CAD-systems and others.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures and workshops*
End-of-semester control	*Test*

151 Automation and Computer Integrated Technologies

Programming	
Restrictions (specialty for which the course is offered)	*Ukrainian - 151 – Automation and computer integrated technologies* *ISCED - 0714 - Electronics and automation*
Educational level	*First level (Bachelor's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Automation Hardware and Software Department*
Assumed knowledge and prerequisites	*Basic knowledge of information technologies and programming including data types, variables, workflow instructions, functions declaration and calling.*
Scope of the course	*The scope of the course includes object-oriented programming in Java and the use of this paradigm for the information systems development.*
Rationale	*The educational component contributes the development of professional experience in programming, object-oriented programming and basic knowledge necessary for informational system design.* *This knowledge is also needed for development of web-based and desktop applications.*
Learning outcomes	*Expected learning outcomes include:* – *object-oriented programming paradigm* – *object-oriented programming principles* – *work with built-in libraries and classes* – *work with external libraries and dependencies*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *develop information systems with different data sources* – *build projects with external dependencies* – *provide system scalability*
Instructional Materials	*syllabus, textbook, reference book*
Mode of delivery	*lectures, laboratory work*
End-of-semester control	*Exam*

Dmytro Kovaliuk, associate professor, dmytro.kovalyuk@gmail.com

Industrial Networks	
Restrictions (specialty for which the course is offered)	*Ukrainian - 151 – Automation and computer integrated technologies* *ISCED - 0714 - Electronics and automation*
Educational level	*Bachelor*
Year of study	*3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Automation Hardware and Software Department*
Assumed knowledge and prerequisites	*English B2* *Completion of educational component "Fundamental Information and Communication Technologies", "Electronic", "Automation Systems Design" or compatible.*
Scope of the course	*The scope of the course includes modern automated control systems and other computer-integrated industrial and non-industrial systems*
Rationale	*The educational component promotes the development of professional experience in industrial data networks technologies, industrial networks types, industrial protocols and interfaces. Attention is also paid to general purpose networks*
Learning outcomes	*Expected learning outcomes include:* – *industrial network technologies,* – *industrial networks types,* – *industrial networks interfaces (RS-232, RS-485),* – *industrial networks protocols (HART, ModBus, ProfiBus, industrial Ethernet)* – *general-purpose network (Ethernet, Web services).*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *design the industrial data networks;* – *debug and configure devices in industrial networks.*
Instructional Materials	*syllabus, textbook, training equipment*
Mode of delivery	*lectures, seminars, practical*
End-of-semester control	*final test*

Denys Skladannyy, associate professor, skl_den@ukr.net

Fundamentals of design of computer-integrated technological complexes

Restrictions (specialty for which the course is offered)	*Ukrainian - 151 – Automation and computer integrated technologies* *ISCED - 0714 - Electronics and automation*
Educational level	*Bachelor*
Year of study	*3*
Number of ECTS credits	*3*
Language of study	*English*
Department	*Automation Hardware and Software Department*
Assumed knowledge and prerequisites	*English B2* *Completion of educational component "Fundamental Information and Communication Technologies", "Programming", "Automation Systems Design" or compatible.*
Scope of the course	*The scope of the course includes modern automated control systems and other computer-integrated industrial and non-industrial systems*
Rationale	*The educational component promotes the development of professional experience in LabVIEW environment and interactive analysis, dataflow programming, and common development techniques. In this course, you will learn how to develop data acquisition, instrument control, data-logging, and measurement analysis applications.*
Learning outcomes	*Expected learning outcomes include:* – *Create user interfaces with charts, graphs, and buttons* – *Use programming structures, data types, and the analysis and signal processing algorithms in LabVIEW* – *Debug and troubleshoot applications* – *Log data to file* – *Use best programming practices for code reuse and readability*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *Create and program a LabVIEW application that acquires, analyzes, and visualizes data*
Instructional Materials	*syllabus, textbook, training equipment*
Mode of delivery	*lectures, seminars, practical*
End-of-semester control	*final test*

Yaroslav Zhurakovskyi, senior lecturer, y.zhurakovsky@kpi.net

Application of computer-integrated technological complexes

Restrictions (specialty for which the course is offered)	*Ukrainian - 151 – Automation and computer integrated technologies* *ISCED - 0714 - Electronics and automation*
Educational level	*Bachelor*
Year of study	*4*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Automation Hardware and Software Department*
Assumed knowledge and prerequisites	*English B2* *Completion of educational component "Fundamentals of design of computer-integrated technological complexes", "Automation Systems Design" or compatible.*
Scope of the course	*The scope of the course includes modern automated control systems and other computer-integrated industrial and non-industrial systems*
Rationale	*The educational component promotes the fundamental knowledge about Information and Coding Theory and development of professional experience in advanced techniques of programming with LabVIEW environment.*
Learning outcomes	*Expected learning outcomes include:* – *design of stand-alone applications in LabVIEW* – *Implementing Design Patterns* – *Use local variables to modify front panel controls* – *Understanding the principles of source coding as well as error-detecting and error-correcting channel coding* *Determining theoretical limits of data compression and error-free data transmission over noisy channels*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *design control loops in LabVIEW* – *design of stand-alone applications in LabVIEW* – *determine the limits of data compression as well as of data transmission through noisy channels and based on those limits to design basic parameters of a transmission scheme* – *estimate the parameters of an error-detecting or error-correcting channel coding scheme for achieving certain performance targets*
Instructional Materials	– *syllabus, textbook, training equipment*
Mode of delivery	*lectures, seminars, practical*
End-of-semester control	*final test*

Yaroslav Zhurakovskyi, senior lecturer, y.zhurakovsky@kpi.net

Basics of Robotics and Machine Vision	
Restrictions (specialty for which the course is offered)	*Ukrainian - 151 – Automation and computer integrated technologies* *ISCED - 0714 - Electronics and automation*
Educational level	*Bachelor*
Year of study	*3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Automation Hardware and Software Department*
Assumed knowledge and prerequisites	*English B2* *Completion of educational component "Physics", "Programming", "Technological Measurements and Devices", "Electronics and Electro-mechanics", "Automation Systems Design" or compatible.*
Scope of the course	*The scope of this course includes robots' construction, kinematics and dynamics, image recognition systems, algorithms and methods for image recognition and device control based on obtained data*
Rationale	*Nowadays use of robots and machine vision systems have become a requirement not only for industry, but also for everyday life. Robots are used to solve problems such as machines and equipment loading/unloading, products transportation, communication with people, studying of hard-to-reach and dangerous environments. Moreover, the requirements of Industry 4.0 cannot be met without robots and machine vision systems. The knowledge and skills acquired by students within the course will make them competitive professionals in Ukraine and abroad.*
Learning outcomes	*Expected learning outcomes include:* – *understanding techniques for collecting visual data from the environment,* – *being able to use and apply appropriate equipment (cameras, radars etc) which fulfils task's purpose* – *strong knowledge of image processing algorithms and methods,* – *robot kinematics and dynamics,* – *being able to apply robot's control algorithms and methods*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *design robots and robotics devices for various purpose;* – *design image recognition systems.*
Instructional Materials	*syllabus, textbook, training equipment*
Mode of delivery	*lectures, labs, practical training*
End-of-semester control	*final test*

Artem Sazonov, associate professor, ayusazonov-ihf@lll.kpi.ua

073 Management

RISK MANAGEMENT	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*First (bachelor)*
Year of study	*4*
Number of ECTS credits	*3,5*
Language of study	*English*
Department	*Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components: "Probability theory and mathematical statistics for managers", "Economics and finance of the enterprise", "Planning and forecasting of the enterprise activity", "Project management", "Economic analysis")*
Scope of the course	*The scope of the course includes specifics of making and tools for implementing economic decisions in conditions of uncertainty, aimed at reducing the likelihood of adverse outcomes and minimizing possible losses of the enterprise from its occurrence*
Rationale	*The educational component contributes to the development of professional expertise in the nature and patterns of economic risks, the acquisition of skills for identification, assessment, modelling and analysis of risks and skills of application of appropriate tools, and on their basis the formation of competencies for economic risk management in the enterprise activity*
Learning outcomes	*Expected learning outcomes include:* *- knowledge of the theory, methods and functions of management, modern concepts of leadership, including approaches to the management of industrial enterprises, in particular the main scientific and methodological approaches that were developed in the field of risk management;* *- knowledge of procedures for searching, collecting and analyzing information, calculating indicators to justify management decisions, including procedures for identifying risks, determining their degree and extent, developing measures for risk management;* *- knowledge of management methods to ensure the effectiveness of the organization, in particular methods of preventing and minimizing the risks of the enterprise;* *- knowledge of the laws of functioning of socio-economic systems of different levels and spheres of activity, namely knowledge of organizational and economic features of the formation of the risk management system at the enterprise;* *- knowledge of methods and principles of enterprise management, in particular in conditions of uncertainty and risk.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- demonstrate skills of identifying problematic parts of the organization's management and substantiation of management decisions aimed at their optimization, in particular the ability to select risk-taking measures;* *- demonstrate skills of situation analysis and communication in various areas of the organization, including in the field of management and business administration of various activities, including risk analysis and determining the relationship of general risk management functions with the stages of risk situation;* *- identify skills of organizational design, in particular to take into account the factors of uncertainty and risk in the process of project development*
Instructional Materials	*syllabus, textbook*
Mode of delivery	*lectures, seminars, workshops*
End-of-semester control	*Exam*

PLANNING OF INTERNATIONAL ACTIVITY	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*First (bachelor)*
Year of study	*4*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components: "Fundamentals of Management", "Foreign Economic Activity of Enterprises", "International Economic Relations", "Marketing")*
Scope of the course	*The scope of the course includes specifics of planning international activities and tools for its implementation by industrial enterprises, aimed at increasing the competitiveness of the enterprise and improving its image in the international arena*
Rationale	*The educational component contributes to the formation of students' system of theoretical knowledge and practical skills in the field of enterprise planning at the international level; focus on the adaptation of foreign experience in planning the entry of enterprises into foreign markets to domestic realities*
Learning outcomes	*Expected learning outcomes include:* *- theories, methods and functions of management, modern concepts of leadership, including approaches to the management of industrial enterprises, in particular the principles and approaches to marketing, financial, operational and personnel planning in international activities;* *- management methods to ensure the effectiveness of the organization, in particular the world experience of building effective management systems for modern organizations, methodologies for designing organizational structures for international activities*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- describe the content of functional areas of the organization, including functional areas of business in the management of industrial enterprises, in particular the content and features of organizational, operational, marketing, personnel and financial planning of international activities;* *- demonstrate skills to identify problematic parts of the management of the organization and justify management decisions aimed at their optimization, in particular, the development of a strategy for international activities; use of various forms and directions of partnership in international activity.* *- demonstrate skills of interaction, leadership, teamwork, in particular when interacting with foreign partners to achieve the best results in international activities;* *- identify skills of organizational design, in particular the ability to choose the appropriate to the scale of international activities of the enterprise organizational structure and organize the process of its effective functioning.*
Instructional Materials	*syllabus,*
Mode of delivery	*lectures, seminars, workshops*
End-of-semester control	*Test*

INTERNATIONAL LOGISTICS	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*First (bachelor)*
Year of study	*4*
Number of ECTS credits	*3,5*
Language of study	*English*
Department	*Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components: "Logistics", "Planning of international activities")*
Scope of the course	*The scope of the course includes specifics of international transportation, stocking and warehousing, and tools for their improvement by enterprises, aimed at increasing the international competitiveness of the enterprise and improving its image in the international arena*
Rationale	*The educational component contributes to the formation of students' ability to organize the process of international transportation of goods, manage transport activities, evaluate the effectiveness of international transport services to consumers, choose the mode of transport for international cargo transportation and form transport and logistics systems based on the best domestic and foreign experience*
Learning outcomes	*Expected learning outcomes include knowledge of:* *-the theory, methods and functions of management, modern concepts of leadership, including approaches to the management of industrial enterprises, in particular methods and principles of management of international transport and logistics activities of enterprises; modern concepts of logistics and management of international supply chains;* *- patterns of functioning of socio-economic systems of different levels and spheres of activity, namely the composition, sequence of development and features of the functioning of the transport and logistics system, the features of its management;* *- modern concepts of management and business administration, in particular the use of advanced information technologies and software and hardware for the organization and management of the process of international transport services;* *- tools for effective management and business administration of business, foreign economic and innovative activities of enterprises, in particular, the principles, processes and features of international transportation of goods, the basic conditions of supply of goods in international traffic, ways to optimize costs for international transport services*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *-analyze the economic, innovative and export potential of the enterprise and develop directions and tools for their development, namely the ability to analyze the problems of the world transport and logistics system, analyze the efficiency of the transport and logistics system of the enterprise during international transport, model logistics business processes in the international environment and reorganize them;* *- assess the legal, social and economic consequences of the organization, including in the field of management and administration of industrial enterprises, in particular the effectiveness of international logistics, determining the cost of international transportation and the cost of transportation.*
Instructional Materials	*syllabus,*
Mode of delivery	*lectures, seminars, workshops*
End-of-semester control	*Test*

MANAGEMENT OF STARTUP PROJECT	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*First (Bachelor)*
Year of study	*4*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component: " Quality Management ", "Management Decisions", " Risk Management ", "Innovation Management", " Business Planning at an Industrial Enterprise ")*
Scope of the course	*The scope of the course includes study of start-up management as a form of innovative business, organization of a start-up from a team to an enterprise,* *formation of business idea of start-up project and creation of viable product, business modelling of start-up, marketing start-ups, business planning of start-up, management of investment support of start-up project, elaboration of legal bases of implementing the start-up project, scaling and strategizing of start-ups*
Rationale	*The educational component contributes to the formation of a system of knowledge and mastering a set of practical skills for the development of start-ups based on scientific and technical designs, managing their creation, implementation and development on the basis of marketing, organizational planning and financial justification using the modern innovation management tools, project management and business modelling. The course includes the acquaintance with the tools of start-up projects, their business modelling and business planning, study of marketing technologies, development methods, investment support, procedures for transforming a start-up into a legal entity in real market conditions.* *The course is built according to the logic of the start-ups development process and the appropriate management tools on the given stage: from the idea origin, then to the development of a business model and finally – scaling into the company.*
Learning outcomes	*Expected learning outcomes include:* *– identify skills of search, collection and analysis of information, calculation of indicators to justify management decisions, in particular for the formation of business ideas of a start-up project, testing the idea and product of a start-up in the market, assessing the market size and niche of business start-up project, procedures determining the cost and price of a start-up product, calculating the financial model of a start-up project, key success factors of start-up projects, methods of estimating the cost and attractiveness of a start-up project for investors;* *– apply management methods to ensure the effectiveness of the organization, including socio-psychological methods of forming and developing a start-up team, organizational and administrative methods of managing acceleration and business incubation of start-ups, scaling a start-up project into an organization, economic methods of start-up project management stages of development, investment support of a start-up project, methods of implementation control and strategic management of start-ups;* *– demonstrate skills of independent work, flexible thinking, openness to new knowledge, be critical and self-critical, in particular flexible thinking during the formation of business model and business plan of a start-up project, marketing, organizational, financial and economic planning, critical assessment of the cost and attractiveness of a start-up project for investors, critical elaboration of the financial model of a start-up project, formation and implementation of a strategy for a lean start-up, pivot of a start-up project, stagnation of a start-up project; innovative thinking for presenting a start-up project, forming a start-up proposal during crowdfunding, independently and self-critically manage your own start-up project;* *– perform research individually and / or in a group under the guidance of a leader, in particular during teamwork development of a start-up project, participation in start-ups, mentoring in a start-up, perform market research, target customers, start-up competitors, search and attract start-ups to enterprises.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *–generate new ideas (creativity), in particular to generate business ideas of start-up projects, their creative search, marketing concepts of their development, to apply creativity in the formation of business models of start-ups;* *–work in a team and establish interpersonal interaction in solving professional problems, in particular to form and work in a start-up project team, to establish interpersonal interaction in the process of its scaling by stages of its development, during mentoring;* *– find new market opportunities, formulate innovative business ideas, develop projects and ensure their implementation, including the ability to perceive the business idea of a start-up, the minimum viable product (MVP) by the market, develop a start-up project, implement it on the basis of business plan in real market conditions, attract resources, investments, provide partnership in the process of implementing a start-up project;* *–initiate and implement own entrepreneurial start-up projects, in particular to develop and implement own start-ups as an innovative project, as an innovative business project with bringing the start-up to a legal organization, to form and implement a business model of a start-up, to apply marketing management to start-ups, organize and business incubation of start-ups, to attract investment in a start-up project, including on the basis of crowdfunding, to apply business strategies for the development of a start-up project, to change a start-up project by pivot.*
Instructional Materials	*Syllabus*
Mode of delivery	*lectures, seminars, workshops*
End-of-semester control	*Exam*

FINANCIAL MANAGEMENT	
Restrictions (specialty for which the course is offered)	073 Management
Educational level	*Second (master's)*
Year of study	*1*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components* International business management, Strategy management in international business*)*
Scope of the course	*The scope of the course includes such topics:* 1. An overview of financial management. 2. Financial statements, cash alow and taxes. 3. Analysis of financial statements. 4. Financial planning and forecasting. 5. The financial environment: markets, institutions and interest rates. 6. Risk and rates of return. 7. Time value of money. 8. Bonds and their valuation. 9. Stocks and their valuation. 10. The cost of capital. 11. The basics of capital budgeting. 12. Cash flow estimation and risk analysis. 13. Capital structure and leverage. 14. Distributions to shareholders: dividends and share repurchases. 15. Working capital management. 16. Multinational financial management..
Rationale	*Discipline Purpose is to form students' understanding of basics of financial management of an enterprise and to form students' skills to perform financial analysis and to make decisions in financial field of business activity of an enterprise*
Learning outcomes	*Expected learning outcomes:* Knowledge: fundamentals of financial management, structure of a financial statement, methods of financial forecasting and planning, basic features of financial environment, stock exchange, the basics of capital budgeting etc.
Competencies and skills	Skills: • Analysis of financial statements • Financial planning and forecasting • Analysis of a financial environment of an enterprise • Assessing risk and rates of return • Calculating time value of money and the cost of capital • Valuation bonds and stocks
Instructional Materials	*syllabus, learning materials (textbooks, articles, presentation materials)*
Mode of delivery	*Lectures, seminars*
End-of-semester control	*Exam*

DESIGN OF INTEGRATION STRUCTURES	
Restrictions (specialty for which the course is offered)	073 Management
Educational level	*Second (master's)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (and* bachelor's degree*)*
Scope of the course	*The scope of the course includes such topics:* Topic 1. Modern theories of organization Topic 2. New forms of integration Topic 3. Interorganizational networks Topic 4. Causes and types of inter-firm network structures Topic 5. Designing an inter-firm strategic alliance Topic 6. Designing value chains and focal network Topic 7. Design of virtual organizations Topic 8. Designing clusters as a form of interorganizational network interaction Topic 9. Information and communication technologies in the development of network interaction of enterprises
Rationale	*Discipline Purpose is* on in-depth study of integration and knowledge of the benefits of inter-firm network interaction in order to increase economic performance and achieve competitiveness in domestic and global markets. The analysis of various network structures leads to more coordinated management decisions - both at the level of a separate business structure and in the formation of public policy.
Learning outcomes	*Expected learning outcomes:* - Design effective management systems for organizations; - Substantiate and manage projects, generate business ideas; - Demonstrate leadership skills and ability to work in a team, interact with people, influence their behavior to solve professional problems; - Be able to delegate authority and management of the organization (unit); - To form the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; to form the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; to form an effective system of internal communications in the organization.
Competencies and skills	Skills: - Ability to motivate people and move towards a common goal; - Ability to effectively use and develop the organization's resources; - Ability to create and organize effective communications in the management process; - Ability to analyze and structure the problems of the organization, make effective management decisions and ensure their implementation; - Ability to develop, economically justify and implement in the practice of the organization design solutions to ensure the efficient use of various types of resources, increase profitability and the formation of prerequisites for capacity development, including human; - Ability to develop projects of organizational development and changes of the organization for the purpose of formation of strategic competitive advantages, to substantiate anti-crisis programs and to provide its effective realization in the conditions of deficit of resources of development.
Instructional Materials	*syllabus, learning materials (textbooks, articles, presentation materials)*
Mode of delivery	*Lectures, seminars*
End-of-semester control	*Test*

Enterprise Development Management	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*2*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes defining the essence of economic systems, basic concepts of the theory of organizational development, the potential of enterprise development and approaches to its evaluation, resource support for enterprise development, models of organizational development of enterprises, the mechanism of management and implementation of organizational change, group dynamics in organizational development, management of resistance to change in the implementation of organizational development projects, conflicts in the organization: causes, types, approaches to management, organizational culture in ensuring the development of the enterprise, ensuring the organizational development of the enterprise based on the use of social capital, organizational development of the enterprise at the strategic level*
Rationale	*The educational component contributes to the development of professional expertise in understanding of changes taking place outside and inside enterprises and organizations, knowledge of laws and principles that determine organizational development, acquire skills of practical use of approaches to change management and overcoming resistance to change, explore the mechanism of organizational change, including due to the use of social capital, the potential for organizational culture, effective group dynamics.*
Learning outcomes	*Expected learning outcomes include:* *- Identifying problems in the organization and justify methods of solving them;* *- Designing effective management systems for organizations;* *- Substantiation and management projects, generation business ideas;* *- Forming the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of current legislation, ethical considerations and social responsibility;* *- Organizing and carrying out effective communication within the team, with representatives of various professional groups and in the international context*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- motivate people and move towards a common goal* *- generate new ideas (creativity)* *- choose and use concepts, methods and tools of management, including in accordance with defined goals and international standards;* *- self-development, lifelong learning and effective self-management* *- create and organize effective communications in the management process* *- use psychological technology to work with staff* *- manage the organization and its development* *- Demonstrate leadership skills and ability to work in a team, interact with people, influence their behavior to solve professional problems;* *- provide personal professional development and planning of own time.* *- delegate authority and management of the organization (unit);* *- plan and implement information, methodological, material, financial and personnel support of the organization (unit).* *- form the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; to form the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; to form an effective system of internal communications in the organization*
Instructional Materials	*syllabus, learning materials (textbook)*
Mode of delivery	*lectures, seminars, workshops, tutorials, case study, business games*
End-of-semester control	*Exam / Test*

STRATEGIC MANAGEMENT	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes defining the essence of* the formation of enterprise strategy, skills of independent analytical thinking, making optimal management decisions that increase the competitiveness of the enterprise and meet modern standards of society. The study of the course begins with a consideration of modern concepts of strategic management and continues with the study of practical approaches to creating a system of strategic management of the enterprise and ensuring its effective functioning.
Rationale	*The educational component contributes to the development of professional expertise in* strategic diagnostics and analysis of the enterprise, the evaluation of strategic potential of the enterprise, the selection and implementation of strategy, choosing the methods of competitiveness evaluation of the organization, portfolio analysis in the development of organizational strategies, providing strategic choice of the enterprise, the implementation of strategy and change management in the organization.
Learning outcomes	*Expected learning outcomes include:* *- Critically design, select and use the necessary scientific, methodological and analytical tools for management in unpredictable conditions;* *- Identifying problems in the organization and justify methods of solving them;* *- Designing effective management systems for organizations;* *- Substantiation and management projects, generation business ideas;* *- Plan the activities of the organization in strategic and tactical sections;* *- Formation the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of current legislation, ethical considerations and social responsibility;* *- Delegate authority and management of the organization (unit);* *- Plan and implement information, methodological, material, financial and personnel support of the organization (unit);* *- Formation the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; forming the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; forming an effective system of internal communications in the organization;* *- Appling the modern approaches and methods of analysis of market conditions, forecasting trends in its development; methods of forming plans and programs for the development of new activities of the organization, products, creation of new organizations.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- Generate new ideas (creativity)* *- Choose and use concepts, methods and tools of management, including in accordance with defined goals and international standards;* - Establish criteria by which the organization determines further directions of development, develop and implement appropriate strategies and plans; - Develop and manage projects, show initiative and entrepreneurship; - Plan and conduct research, prepare the results of scientific work for publication; - Develop a corporate strategy of the organization on the basis of a comprehensive analysis of the internal and external environment, critical assessment of the consequences of economic policy, justify the mechanisms for implementing the strategy, evaluate its effectiveness; - Develop projects of organizational development and organizational change in order to form strategic competitive advantages, justify anti-crisis programs and ensure its effective implementation with limit resources.
Instructional Materials	*syllabus, learning materials (textbook), presentation*
Mode of delivery	*Lectures, seminars, workshops, tutorials, case study, business games, Youcontrol system.*
End-of-semester control	*Exam, course work*

Human Resource Management Technologies	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	***Second (master's)***
Year of study	*1*
Number of ECTS credits	*4 credits (120 hours)*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Fundamentals of Management", "Sociology", "Fundamentals of Economic Theory", "Macroeconomics", "Microeconomics")*
Scope of the course	*The scope of the course includes:* *Topic 1. The essence of human resource management and its role in the development of the organization.* *Topic 2. Strategic planning and policy in the field of human resource management of the organization.* *Topic 3. Formation of the organization's team. Headhunting: principles and technologies* *Topic 4. Modern technologies of team building. DISC technology* *Topic 5. Coaching technologies and their application in the development of human resources of the organization.* *Topic 6. Emotional competence in the development of management staff.* *Topic 7. Business valuation as a technology of personnel management* *Topic 8. Modern dream of technology to increase productivity in the company* *Topic 9. Performance Management as a technology to improve staff performance.* *Topic 10. Technology Assessment Center and its application in the evaluation of employees.* *Topic 11. Evaluation of employees by the method of Hay Group.* *Topic 12. Methodology for evaluating employees on the matrix A-players* *Topic 13. Competence approach and its use in human resource management of the organization.* *Topic 14. Technologies for the release of human resources in a crisis: downsizing, reengineering, outplacement.* *Topic 15. LifeLong Learning and learning transformation* *Topic 16. Digital tools in HR* *Topic 17. Blockchain technologies in HR* *Topic 18. The use of AI (artificial intelligence) in recruitment and HR*
Rationale	*The educational component contributes to the development of professional expertise in human resource management*
Learning outcomes	*Expected learning outcomes include:* *– the formation of future managers of modern management thinking and a system of specialized knowledge in management,* *– the formation of understanding of the conceptual foundations of human resources management and the acquisition of skills to analyse the impact of internal and external environment,* *- human resources organization and motivation of their work.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- to independently solve certain practical issues of human resource management, using modern technologies;* *- be able to identify the main aspects of the human resources management department of the organization;* *- be able to identify problems facing management in the field of human resource management and find ways to solve them;* *- assess the factors that determine the use of certain technologies of human resource management;*
Instructional Materials	*syllabus, learning materials (textbook, reference book, video lectures)*
Mode of delivery	*lectures, seminars, workshops*
End-of-semester control	*Test*

Digital Business Transformation

Restrictions (specialty for which the course is offered)	073 Management
Educational level	*Second (master's)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Business Process Management")*
Scope of the course	*The scope of the course includes such topics: Topic 1. Introduction to digital transformation* *Topic 2. Basic principles of digital transformation* *Topic 3. The process of digital transformation* *Topic 4. Digital platforms as a tool for digital transformation* *Topic 5. Business processes as a basis for digital transformations* *Topic 6. Personnel issues of digital transformation* *Topic 7. Digital transformation as an element of corporate strategy* *Topic 8. Readiness for digital transformation*
Rationale	*The educational component contributes to the development of professional expertise in the field of preparation of the organization for the transition to digital transformation of its activities; analyze the organization's readiness for digital change, use digital tools to transform the business in the face of digital change.*
Learning outcomes	*Expected learning outcomes include:* - *Critically comprehend, select and use the necessary scientific, methodological and analytical tools for management in unpredictable conditions;* - *- Have the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of current legislation, ethical considerations and social responsibility;* - *- Use specialized software and information systems to solve management problems of the organization;* - *- Be able to plan and implement information, methodological, material, financial and personnel support of the organization (unit).* - *- To form the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; to form the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; to form an effective system of internal communications in the organization;* - *- Apply modern technologies for organizing information support of analytical activities at enterprises; methods of analysis and evaluation of the processes of development of the organization, components of its economic potential, diagnosis of crisis phenomena*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* - *use of information and communication technologies;* - *to generate new ideas (creativity);* - *abstract thinking, analysis and synthesis;* - *find and evaluate new market opportunities for the development of the organization, promising areas of activity, to justify the mechanisms of transformation of management systems based on integration management decisions.*
Instructional Materials	*syllabus, learning materials (textbooks, articles, presentation materials)*
Mode of delivery	*Lectures, seminars*
End-of-semester control	*Test*

BUSINESS -MANAGEMENT	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*Second (Master's)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component: "Enterprise Development Management", "Strategic Management", "Financial Management")*
Scope of the course	*The scope of the course includes essentials of business management as follows: the role and importance of business enterprise, management of its functional subsystems, functional areas of business management, business models of the enterprises, operational procedures of business implementation, stakeholder management, procurement and supplier relations management, development of key business performance indicators (KPI).*
Rationale	*The educational component contributes to understanding the methodological and practical provisions of business management, implemented by industrial enterprises, the formation of skills in using the managerial tools and technologies, development of management and administrative skills in predictable and unpredictable conditions. The component of the educational program involves studying the business system of the enterprise, building and improving the business model, developing the concept of business enterprise, functional areas of business management, operating procedures and business model of the enterprise in the business environment, its procurement and commercial activities, tools for managing the relationships with suppliers and consumers, as well as determining business performance based on key indicators*
Learning outcomes	*Expected learning outcomes include the abilities to:* – *critically* comprehend, select and use the necessary scientific, methodological and analytical tools for management in unpredictable conditions*;* – *identify* problems in the organization and justify methods of solving them*;* – develop the effective management systems for organizations*;* – have the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of applicable law, ethical considerations and social responsibility*;* – *use* specialized software and information systems to solve management problems of the organization*;* – communicate in professional and scientific circles in the state and foreign languages*;* – delegate authority and management of the organization (unit)*;* – plan and implement information, methodological, material, financial and personnel support of the organization (unit)*;* – *form the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; to form the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; to form an effective system of internal communications in the organization;* – *apply modern approaches and methods of analysis of market conditions, forecasting trends in its development; methods of formation of plans and programs of development of new directions of activity of the organization, products, creation of new organizations;* – *apply modern technologies of organization of information support of analytical activity at the enterprises; methods of analysis and evaluation of the processes of development of the organization, components of its economic potential, diagnosis of crisis phenomena;*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– conduct research at the appropriate level;* *– communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity);* *– act on the basis of ethical considerations (motives);* – select and use concepts, methods, and management tools, including in accordance with defined goals and international standards*;* *– create and organize effective communications in the management process;* *– manage organizations of different forms of ownership and areas of activity, departments, groups (teams) of employees, projects and networks using a system of modern management methods, technologies, integrated management approaches;* *– find and evaluate new market opportunities for the development of the organization, promising areas of activity, to justify the mechanisms of transformation of management systems based on integration management decisions*
Instructional Materials	*Syllabus*
Mode of delivery	*lectures, seminars, workshops*
End-of-semester control	*Exam*

FINANCIAL MANAGEMENT	
Restrictions (specialty for which the course is offered)	073 Management
Educational level	*Second (master's)*
Year of study	*1*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components* International business management, Strategy management in international business*)*
Scope of the course	*The scope of the course includes such topics:* 1. An overview of financial management. 2. Financial statements, cash alow and taxes. 3. Analysis of financial statements. 4. Financial planning and forecasting. 5. The financial environment: markets, institutions and interest rates. 6. Risk and rates of return. 7. Time value of money. 8. Bonds and their valuation. 9. Stocks and their valuation. 10. The cost of capital. 11. The basics of capital budgeting. 12. Cash flow estimation and risk analysis. 13. Capital structure and leverage. 14. Distributions to shareholders: dividends and share repurchases. 15. Working capital management. 16. Multinational financial management..
Rationale	*Discipline Purpose is to form students' understanding of basics of financial management of an enterprise and to form students' skills to perform financial analysis and to make decisions in financial field of business activity of an enterprise*
Learning outcomes	*Expected learning outcomes:* Knowledge: fundamentals of financial management, structure of a financial statement, methods of financial forecasting and planning, basic features of financial environment, stock exchange, the basics of capital budgeting etc.
Competencies and skills	Skills: • Analysis of financial statements • Financial planning and forecasting • Analysis of a financial environment of an enterprise • Assessing risk and rates of return • Calculating time value of money and the cost of capital • Valuation bonds and stocks
Instructional Materials	*syllabus, learning materials (textbooks, articles, presentation materials)*
Mode of delivery	*Lectures, seminars*
End-of-semester control	*Exam*

DESIGN OF INTEGRATION STRUCTURES	
Restrictions (specialty for which the course is offered)	073 Management
Educational level	*Second (master's)*
nnYear of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (and* bachelor's degree*)*
Scope of the course	*The scope of the course includes such topics:* Topic 1. Modern theories of organization Topic 2. New forms of integration Topic 3. Interorganizational networks Topic 4. Causes and types of inter-firm network structures Topic 5. Designing an inter-firm strategic alliance Topic 6. Designing value chains and focal network Topic 7. Design of virtual organizations Topic 8. Designing clusters as a form of interorganizational network interaction Topic 9. Information and communication technologies in the development of network interaction of enterprises
Rationale	*Discipline Purpose is* on in-depth study of integration and knowledge of the benefits of inter-firm network interaction in order to increase economic performance and achieve competitiveness in domestic and global markets. The analysis of various network structures leads to more coordinated management decisions - both at the level of a separate business structure and in the formation of public policy.
Learning outcomes	*Expected learning outcomes:* - Design effective management systems for organizations; - Substantiate and manage projects, generate business ideas; - Demonstrate leadership skills and ability to work in a team, interact with people, influence their behavior to solve professional problems; - Be able to delegate authority and management of the organization (unit); - To form the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; to form the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; to form an effective system of internal communications in the organization.
Competencies and skills	Skills: - Ability to motivate people and move towards a common goal; - Ability to effectively use and develop the organization's resources; - Ability to create and organize effective communications in the management process; - Ability to analyze and structure the problems of the organization, make effective management decisions and ensure their implementation; - Ability to develop, economically justify and implement in the practice of the organization design solutions to ensure the efficient use of various types of resources, increase profitability and the formation of prerequisites for capacity development, including human; - Ability to develop projects of organizational development and changes of the organization for the purpose of formation of strategic competitive advantages, to substantiate anti-crisis programs and to provide its effective realization in the conditions of deficit of resources of development.
Instructional Materials	*syllabus, learning materials (textbooks, articles, presentation materials)*
Mode of delivery	*Lectures, seminars*
End-of-semester control	*Test*

STRATEGIC MANAGEMENT IN INTERNATIONAL BUSINESS	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes defining the essence of* the formation of international business strategy, skills of independent analytical thinking, making optimal management decisions that ensure the growth of international business competitiveness. The study of the course begins with a consideration of modern concepts of strategic management of international business and continues with the study of practical approaches to creating a system of strategic management and ensuring its effective functioning.
Rationale	*The educational component contributes to the development of professional expertise in* strategic diagnostics and analysis of the international business, the evaluation of strategic potential of the international business, the selection and implementation of international strategy, choosing the methods of competitiveness evaluation of the international companies, portfolio analysis in the development of international strategies, providing strategic choice of the international business, the implementation of strategy and change management in the international business.
Learning outcomes	*Expected learning outcomes include:* *- Identifying problems in the organization and justify methods of solving them;* *- Substantiation and management projects, generation business ideas;* *- Plan the activities of the organization in strategic and tactical sections;* *- Formation the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of current legislation, ethical considerations and social responsibility;* *- Using specialized software and information systems to solve management problems of the organization;* *- Delegate authority and management of the organization (unit);* *- Forming the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; forming the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; forming an effective system of internal communications in the organization.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* - Identify and solve problems, generate new ideas; - Establish criteria by which the organization determines further directions of development, develop and implement appropriate strategies and plans; - Develop and manage projects, show initiative and entrepreneurship; - Manage the organization and its development; - Develop a corporate strategy of the organization on the basis of a comprehensive analysis of the internal and external environment, critical assessment of the consequences of economic policy, justify the mechanisms for implementing the strategy, evaluate its effectiveness; - Organize, plan foreign economic activity of enterprises taking into account current trends in the world economy and using promising business models; - Develop projects of organizational development and organizational change in order to form strategic competitive advantages, justify anti-crisis programs and ensure its effective implementation in a shortage of development resources.
Instructional Materials	*syllabus, learning materials (textbook), presentation*
Mode of delivery	*Lectures, seminars, workshops, tutorials, case study, business games, Youcontrol system.*
End-of-semester control	*Exam*

DIGITAL TRANSFORMATION AND NEW BUSINESS MODELS

Restrictions (specialty for which the course is offered)	073 Management
Educational level	*Second (master's)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Management of Enterprises*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Business Process Management")*
Scope of the course	*The scope of the course includes such topics: Topic 1. Introduction to digital transformation* *Topic 2. Basic principles of digital transformation* *Topic 3. Digital platforms as a tool for digital transformation* *Topic 4. Concepts and types of business models* *Topic 5. Platform as a business model* *Topic 6. Digital duplicates in digital transformation* *Topic 7. Creating a digital business model for digital transformation.*
Rationale	*The educational component contributes to the development of professional expertise in the field of preparation of the organization for the transition to digital transformation of its activities; analyze the organization's readiness for digital change, use digital tools to transform the business in the face of digital change; choose and apply modern business models.*
Learning outcomes	*Expected learning outcomes include:* - *Identify problems in the organization and justify methods of solving them;* - *Design effective management systems for organizations;* - *Have the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of current legislation, ethical considerations and social responsibility;* - *Have the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of current legislation, ethical considerations and social responsibility;* - *Organize and carry out effective communication within the team, with representatives of various professional groups and in the international context;* - *Use specialized software and information systems to solve management problems of the organization;* - *Be able to plan and implement information, methodological, material, financial and personnel support of the organization (unit).* - *To form the mission, goals, values and philosophy of development of a modern organization, to develop its corporate strategy; to form the management system of the organization taking into account its scales, directions of activity, development potential; design organizational management structures; to form an effective system of internal communications in the organization;* - *Be able to identify patterns, conditions and factors of national and international nature that determine the formation of effective strategies for international business development* - *Apply modern technologies for organizing information support of analytical activities at enterprises; methods of analysis and evaluation of the processes of development of the organization, components of its economic potential, diagnosis of crisis phenomena*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* - *use of information and communication technologies;* - *to act on the basis of ethical considerations (motives);* - *to generate new ideas (creativity);* - *to create and organize effective communications in the process щof management* - *to form strategies of international activity of enterprises on the basis of export-oriented development taking into account the potential of digital transformations in the world economy* - *to find and evaluate new market opportunities for the development of the organization, promising areas of activity, to justify the mechanisms of transformation of management systems based on integration management decisions.*
Instructional Materials	*syllabus, learning materials (textbooks, articles, presentation materials)*
Mode of delivery	*Lectures, seminars*
End-of-semester control	*Test*

International Management	
Restrictions (specialty for which the course is offered)	*073 Management*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component* Strategic Management in International Business*)*
Scope of the course	*The scope of the course includes:* *Topic 1. International business and international management in the context of globalization* *Topic 2. The environment of international business* *Topic 3. Comparative analysis of business cultures in international business* *Topic 4. Strategic planning in the system of international management* *Topic 5. Integrated structures of international business* *Topic 6. Human resource management and communication in international corporations* *Topic 7. Motivation in international management and management style of multinational corporations* *Topic 8. Control reporting in international management* *Topic 9. Technological policy of international corporations* *Topic 10. International scientific and technical cooperation* *Topic 11. Ethics and social responsibility of international business* *Topic 12. Global perspectives of TNCs*
Rationale	*The educational component contributes to the development of practical skills in the field of management at the international level; study of world experience in international management.*
Learning outcomes	*Expected learning outcomes include:* *- Identifying problems in the organization and justify methods of solving them;* *- Designing effective management systems for organizations;* *- Substantiation and management projects, generation business ideas for international market;* *- Forming the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of local legislation, ethical considerations and social responsibility;* *- Organizing and carrying out effective communication within the international team, with representatives of various professional groups*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- motivate people and move towards a common goal* *- create and organize effective communications in the management process* *- use psychological technology to work with staff* *- manage the organization and its development in the international level* *- Demonstrate leadership skills and ability to work in a team, interact with people, influence their behavior to solve professional problems;* *- analyze the environment of the company engaged in international business transactions;* *- identify the characteristics and requirements for managers working in different countries, and their ability to adapt to local characteristics;* *- choose the development strategy of the international company taking into account its priorities;* *- design organizational management structures for the international corporation as a whole and its structural units;* *- prepare proposals to the company's management to improve staff motivation, taking into account the national cultures.*
Instructional Materials	*syllabus, learning materials (textbook)*
Mode of delivery	*lectures, seminars, workshops, case study, business games*
End-of-semester control	*Exam*

Management of Foreign Exchange Transactions	
Restrictions (specialty for which the course is offered)	*073 management*
Educational level	*2nd (Master's Degree)*
Year of study	*1*
Number of ECTS credits	*5,5*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2, Financial Management*
Scope of the course	*The scope of the course includes defining the essence of foreign exchange transactions, International monetary system, the essence and types of exchange rates, basics of foreign exchange regulation and control, the structure of the balance of payments, the essence and classification of foreign exchange transactions, basic types of foreign exchange transactions, basics of foreign exchange risk management, structure of the foreign exchange market.*
Rationale	*The educational component contributes to the development of professional expertise in understanding the essence of foreign exchange transactions, calculating the profit from different types of transactions in certain circumstances, etc.*
Learning outcomes	*- Ability to select and use management concepts, methods and tools in accordance with defined objectives and international standards. In particular, to establish cooperation with banks and other credit and financial institutions, including international ones,* *- Ability to effectively use and develop the resources of the organization, in particular in the development of a strategy for hedging currency risks, the implementation of foreign exchange transactions, documentation of foreign exchange transactions*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *-To determine and develop optimal forms of organization of foreign economic and international activities of enterprises, taking into account the peculiarities of international activities, including exchange rate policy.* *- Be able to identify patterns, conditions and factors of national and international nature, in particular in the field of exchange rate policy.* *- Identify and analyze the possible impact of current trends in the world economy on the functioning of international business entities, in particular trends in exchange rates*
Instructional Materials	*syllabus, learning materials (textbook)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Exam*

Corporate Governance	
Restrictions (specialty for which the course is offered)	*073 management*
Educational level	*2nd (Master's Degree)*
Year of study	*1*
Number of ECTS credits	*5,5*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2, Enterprise Development Management, Strategic Management*
Scope of the course	*The scope of the course includes the following topics:* *1. Shares and stock market participants* *2. Models of corporate governance* *3. Agency conflicts and ways to resolve them* *4. Company stakeholders* *5. Structure and functions of the Board of Directors.* *6. Corporate governance standards* *7. Company management and corporate governance efficiency*
Rationale	*World experience shows that in economically developed countries the basis of national economies are corporations. They contribute to the concentration of capital and investing it in areas that ensure competitiveness in global and national markets.* *The educational component contributes to the development of professional expertise in corporate management and acquisition of practical skills in managing corporate entities.*
Learning outcomes	*- ability to determine the peculiarities of the functioning of joint stock companies and making effective decisions in the process of managing joint-stock companies;* *- ability to identify problems of corporate rights management;* *- ability to work in framework of regulations in the field of corporate governance;* *- ability to choose an adequate dividend policy.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- to determine the rights and responsibilities of participants in corporate entities;* *- to form requirements for disclosure of corporate information;* *- to determine the dividend policy of the joint-stock company;* *- to analyze the existing ownership structure, control system over the organization;* *- to develop a Corporate Governance Code;* *- to develop a corporate development strategy.*
Instructional Materials	*syllabus, learning materials (textbook)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Exam*

DESIGN THINKING	
Restrictions (specialty for which the course is offered)	*073 management*
Educational level	*2nd (Master's Degree)*
Year of study	*1*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2, Enterprise Development Management*
Scope of the course	*The scope of the course includes the following topics:* *Topic 1. Conceptual foundations of design thinking. The origin and evolution of industrial design.* *Topic 2. Design thinking as a tool for business development.* *Topic 3. Socio-psychological foundations of design thinking models.* *Topic 4. Stages of design thinking implementation: Stanford model.* *Topic 5. Methods, tools and organization of design thinking sessions.* *Topic 6. Strategic aspects of design thinking.* *Topic 7. Design management.* *Topic 8. The role of designer in the design process. Design leadership.* *Topic 9. Design thinking: prospects for development and limitations.*
Rationale	*The discipline provides the acquisition of a set of knowledge and practical skills necessary for the generation and development of innovative ideas in various fields of professional activity including management, innovations, marketing and customer relationship.*
Learning outcomes	*Knowledge:* – *Conceptual foundations of design thinking;* – *Stages of design thinking projects;* – *Socio-psychological models of design thinking;* – *Sources, mechanisms and methods of generating new ideas in the work environment;* – *Modern approaches to manage design team dynamic;* – *Key characteristics of creative leadership;*
Competencies and skills	- *Ability to analyze generated ideas and assess their potential;* - *Ability to comprehensively analyze and evaluate the factors influencing the efficiency of design thinking in the organization;* - *Ability to apply development strategies to design thinking at individual and organizational levels;* - *Ability to form and manage design teams in the organization.*
Instructional Materials	*syllabus, learning materials (textbook)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

Technology Transfer	
Restrictions (specialty for which the course is offered)	*073 management*
Educational level	*2nd (Master's Degree)*
Year of study	*1*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2, Innovation Management*
Scope of the course	*The scope of the course includes the following sections:* – *the role of technology transfer in the technological development of the enterprise;* – *technology transfer system;* – *methods and ways to implement technology transfer;* – *intellectual property in the technology transfer system.* – *means of commercialization in the process of technology transfer.* – *technology transfer infrastructure.*
Rationale	*The discipline is designed to form a system of basic knowledge about the transfer process technologies, features of their commercialization and exchange.* *The discipline studies the theory and applied aspects of technology transfer, its methods, methods of implementation by enterprises, corporations, universities, technological parks.*
Learning outcomes	*knowledge:* *- features of technology commercialization;* *- methods of searching for and attracting technologies to the transfer;* *- methods of estimating the cost of technology;* *skills:* *- search for technologies to attract and transfer them;* *- draw up agreements for the acquisition, creation, transfer of rights and sale of technology;* *- draw up technology transfer agreements and license agreements;* *- to conduct patent search and patent and market research;* *- negotiate technology transfer;* *- assess the commercial potential of the technology;* *- to introduce the transferred technology into economic turnover;* *- determine the economic efficiency of technology transfer.*
Competencies and skills	*- ability to generate new ideas for choosing, finding and attracting technology;* *- ability to diagnose technological processes and technological base of the enterprise;* *- ability to develop a technology transfer strategy;* *- ability to substantiate organizational and investment mechanisms of transfer technologies;* *- ability to implement technology transfer between interacting enterprises, research institutes, design organizations;* *- ability to provide consulting services to commercial and non-commercial organizations on technological exchange, the conclusion of agreements on technology transfer;* *- ability to determine the feasibility of technological exchange*
Instructional Materials	*syllabus, learning materials (textbook)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

Environmental Management	
Restrictions (specialty for which the course is offered)	*073 management*
Educational level	*2nd (Master's Degree)*
Year of study	*1*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Enterprise management*
Assumed knowledge and prerequisites	*English B2, Enterprise Development Management, Strategic Management*
Scope of the course	*The scope of the course includes the following topics:* *1. Subject and theoretical principles of environmental management;* *2. System of state ecological management;* *3. Environmental management system at an industrial enterprise;* *4. Methods for assessing environmental and economic losses; Socio-economic efficiency of environmental protection measures;* *5. Ecological expertise; Environmental accounting, audit and insurance at the enterprise;* *6. Environmental marketing;* *7. Innovations in environmental management.*
Rationale	*The educational component contributes to the development of students' competence in theoretical positions and practical approaches to ecologically oriented management of a modern enterprise, building a system of environmental management in the enterprise and implementation of policy of greening economic activity by entities of different hierarchical levels.*
Learning outcomes	*Formation of ecologically oriented managerial style of thinking,* *Knowledge of theoretical environmental protection basics* *Development of skills needed for green policy implementation at the enterprise*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- to analyze the impact of environmental factors on the effectiveness of socio-economic systems of different hierarchical levels;* *- to assess the environmental costs of the enterprise, its ecological and economic losses;* *- to form and implement a policy of greening the enterprise as a tool development of its competitive advantages;* *- to evaluate the economic efficiency of investment projects taking into account environmental factor;* *- to implement an environmental management system at the enterprise.*
Instructional Materials	*syllabus, learning materials (textbook)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

171 Electronics

Measuring Technique	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*1*
Number of ECTS credits	*3,5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Physics")*
Scope of the course	*The scope of the course includes:* *- basic concepts of metrology and methodology;* *- basics of measurement techniques in experimental research and processing of their results;* *- basics of the theory of measurement errors and measuring instruments;* *- basic methods of improving the accuracy of measurements;* *- ways to present measurement results with uncertainty;* *- organization of state, international and interstate standardization.*
Rationale	*The educational component contributes to the development of professional expertise in the practice of measurements, methods and means of achieving the required accuracy of measurements in the field of electronics, the basic principles of standardization, the structure of the certification system UkrSEPRO, international cooperation of Ukraine in metrology, standardization, certification and accreditation, international standards ISO 9000.*
Learning outcomes	*Expected learning outcomes include:* *– O 6 - Apply experimental skills (knowledge of experimental methods and the order of experiments) to test hypotheses and study the phenomena of electronics, be able to use standard equipment, plan, make diagrams; analyze, model and critically evaluate the results* *– O 9 - Design complex real-time systems and means of collecting and processing information, consistent with the specified information and software by using software for embedded systems based on microcontrollers* *– O 17 - Demonstrate skills in conducting experimental research related to professional activities; to improve measurement methods; control the reliability of the obtained results; systematize and analyze the data obtained experimentally* *– O 20 - Apply modern methods of production quality control, conduct testing, certification and examination of production equipment, parts, assemblies and finished electronic and acoustic products and devices*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 2 - Knowledge and understanding of the subject area and understanding of professional activity* *– PC 13 - Ability to apply modern methods of production quality control, to conduct testing, certification and examination of production equipment, parts, assemblies and finished electronic products and devices*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Materials Science in Electronics	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Analytic Geometry", "Physics", "Chemistry")*
Scope of the course	*The scope of the course includes the study of electricalphysical and thermophysical parameters and characteristics of materials and the basics of the theory of energy states of charge carriers in them; patterns of electrical conductivity of substances in different conditions and when the temperature changes.*
Rationale	*The educational component contributes to the development of professional expertise in features of the use of electrical materials and electronic components in devices and devices; the main directions of development of materials science in electronics; organization of state, international and interstate standardization in the field of electronic components.*
Learning outcomes	*Expected learning outcomes include:* *– O 4 - Evaluate the characteristics and parameters of electronic materials, understand the basics of solid-state, functional, quantum and power electronics, electrical engineering, analog and digital circuitry, converter and microprocessor technology*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– PC 1 - Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices, components and systems of electronics* *– PC 6 - Ability to identify, classify, evaluate and describe processes in electronics devices, devices, components and systems using analytical methods, modeling tools, prototypes and experimental results* *– PC 8 - Ability to solve engineering problems in the field of electronics taking into account all aspects of development, design, production, operation and modernization of electronic devices, devices, components and systems* *– PC 9 - Ability to determine and evaluate the characteristics and parameters of materials of electronic equipment, analog and digital electronic devices for the design of microprocessor and electronic systems*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Exam*

Physical Fundamentals of Electronics	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Analytic Geometry", "Physics", "Chemistry", "Materials and components of electronics")*
Scope of the course	*The scope of the course includes the study of physical processes of current passage and the theory of energy states of charge carriers in solid-state electronics, their features in materials of different types of electrical conductivity, different physical state with changes in temperature, charges and electric potential.*
Rationale	*The educational component contributes to the development of professional expertise in classification of substances by electrical properties; definitions and basic concepts of quantum mechanics; regularities of description of electronic states in a solid body; description of wave processes by the Schrödinger equation; mechanisms of behavior of microparticles and their groups, elements of static physics; distribution functions and laws of statistical averaging; band theory of crystalline materials; band structure of dielectrics, metals and semiconductors; dependence of electrical conductivity of substances on temperature; causes of electrical resistance; processes of relaxation of charge carriers; regularities of the transition of electrons across the boundary of media; the dynamics of processes in the p-n junction and the causes and development of the breakdown of the p-n junction.*
Learning outcomes	*Expected learning outcomes include:* *– O 4 - Evaluate the characteristics and parameters of electronic materials, understand the basics of solid-state, functional, quantum and power electronics, electrical engineering, analog and digital circuitry, converter and microprocessor technology*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– PC 1 - Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices, components and systems of electronics* *– PC 3 - Ability to integrate knowledge of fundamental sections of physics and chemistry to understand the processes of solid-state, functional, quantum and energy electronics, electrical engineering, field theory* *– PC 4 - Ability to take into account social, environmental, ethical, economic and commercial considerations that affect the efficiency and results of engineering activities in the field of electronics* *– PC 6 - Ability to identify, classify, evaluate and describe processes in electronics devices, devices, components and systems using analytical methods, modeling tools, prototypes and experimental results* *– PC 8 - Ability to solve engineering problems in the field of electronics taking into account all aspects of development, design, production, operation and modernization of electronic devices, devices, components and systems*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Exam*

Calculus	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Physics", "Informatics I. Personal Computers and Fundamentals of Programming", "Informatics II. Programming and Algorithmic Languages")*
Scope of the course	*The scope of the course includes acquisition by students of theoretical and practical knowledge, skills and abilities of application of numerical methods of computational mathematics for the decision of applied problems of mathematics, electronics, circuitry, the analysis and synthesis of electronic systems.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- analysis of numerical methods of computational mathematics in terms of their convergence and stability;* *- estimates of calculation errors that occur at different stages of the use of numerical methods;* *- use of application packages of mathematical software.*
Learning outcomes	*Expected learning outcomes include:* *– O 2 - Apply knowledge and understanding of differential and integral calculus, algebra, functional analysis of real and complex variables, vectors and matrices, vector calculus, differential equations in ordinary and partial derivatives, Fourier series, statistical analysis, information theory, numerical methods, basics of automatic theory regulation to solve theoretical and applied problems of electronics*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– PC 1 - Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices, components and systems of electronics* *– PC 5 - Ability to apply appropriate mathematical, scientific and technical methods, modern information technology and computer software, skills in working with computer networks, databases and Internet resources to solve engineering problems in the field of electronics* *– PC 6 - Ability to identify, classify, evaluate and describe processes in electronics devices, devices, components and systems using analytical methods, modeling tools, prototypes and experimental results* *– PC 8 - Ability to solve engineering problems in the field of electronics taking into account all aspects of development, design, production, operation and modernization of electronic devices, devices, components and systems*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Programming of Embedded Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*3*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Informatics I. Personal Computers and Fundamentals of Programming", "Informatics II. Programming and Algorithmic Languages")*
Scope of the course	*The scope of the course includes create objects that combine properties and behavior into an independent union that can then be reused. It is an opportunity to master a tool that allows you to write programs in a modular way, which not only simplifies the writing and understanding of code, but also provides a higher degree of reusability of this code and its application to complex technical objects.*
Rationale	*The educational component contributes to the development of professional expertise in define object classes, regulate access to data and methods, implement methods, define class hierarchies, use standard language libraries.*
Learning outcomes	*Expected learning outcomes include:* *– O 7 - Analyze complex digital and analog information-measuring systems with advanced architecture of computer and telecommunication networks taking into account the specification of selected technical means of electronics and relevant technical documentation* *– O 8 - Define and identify mathematical models of technological objects in the development of new complex electronic systems in a computer environment and choosing the optimal solution*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 5 - Skills in the use of information and communication technologies* *– PC 1 - Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices, components and systems of electronics* *– PC 5 - Ability to apply appropriate mathematical, scientific and technical methods, modern information technology and computer software, skills in working with computer networks, databases and Internet resources to solve engineering problems in the field of electronics* *– PC 6 - Ability to identify, classify, evaluate and describe processes in electronics devices, devices, components and systems using analytical methods, modeling tools, prototypes and experimental results* *– PC 8 - Ability to solve engineering problems in the field of electronics taking into account all aspects of development, design, production, operation and modernization of electronic devices, devices, components and systems*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Theory of Electrical Circuits	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Analytic Geometry", "Physics")*
Scope of the course	*The scope of the course gives the concept of real electrical devices with their simplified models – electronic circuits, provides knowledge of the basic methods of calculating DC and AC circuits – features of these methods and their feasibility for a particular circuit topology. In the process of practical classes and independent work, students consolidate the theoretical knowledge obtained in solving specific problems, and in laboratory studies on the stands with the use of measuring instruments receive visual confirmation of the theory and check theoretical calculations.*
Rationale	*The educational component contributes to the development of professional expertise in* *1) knowledge of the fundamental issues of mathematics, which is necessary to master the mathematical apparatus of respective field of knowledge, the ability to use mathematical methods in the chosen profession. Knowledge in the field of informatics and modern information technologies required to work with software and computer networks, databases and Internet resources;* *2) knowledge of the basic properties of conducting, semiconducting, dielectric and other materials in electronics;* *3) knowledge of electronic technique components and devices, their structure, principles of operation, basic characteristics, methods of analysis and synthesis;* *4) knowledge of modern computer technologies and tools for engineering and scientific calculations, data processing, graphics, simulation and optimization, up–to–date instruments of information technology;* *5) knowledge of the basics of analog and digital circuit technology, microprocessor technology, measuring instruments, the basics of process automation in technology, design and production;* *6) ability to apply modern information and communication technologies for solving engineering problems in the field of electronics;* *7) ability to analyse processes in electronic devices and systems using mathematical methods; provide specified operating modes, use and operate electronic devices;* *8) ability to solve problems of optimization, modification and updating of electronic devices and systems technology and production; electronic devices structure calculation, simulation and designing;* *9) ability to assess the operation of electronic devices and systems; to determine deviations when parameters and modes of operation of electronic devices out of normal mode; to adjust respective electronic devices and systems for achieving normal modes of operation.*
Learning outcomes	*Expected learning outcomes include:* *– O 1 - Describe the principle of operation using scientific concepts, theories and methods and test the results in the design and application of devices, devices and systems of electronics*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– PC 2 - Ability to perform analysis of the subject area and regulatory documentation required for the design and application of devices, devices, components and electronics systems* *– PC 3 - Ability to integrate knowledge of fundamental sections of physics and chemistry to understand the processes of solid-state, functional, quantum and energy electronics, electrical engineering, field theory* *– PC 12 - Ability to develop working technical documentation, design work with verification of compliance with standards, specifications and other regulations*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical, Laboratory*
End-of-semester control	*Final test*

Nonlinear Electric Circuits and Transient Processes	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*6*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Analytic Geometry", "Physics", "Personal Computers and Fundamentals of Programming")*
Scope of the course	*The scope of the course includes study of the basic properties, laws and methods of calculation of electrical circuits. In the process of studying the course, students get acquainted with the methods of quantitative analysis of steady-state and transient phenomena and processes occurring in linear and nonlinear circuits of direct and alternating currents.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- perform calculations of electric and magnetic circuits;* *- to make electric circuits according to their basic schemes;* *- analyze the operation of circuits in steady-state and transient modes;* *- use modern computer technology to solve problems.*
Learning outcomes	*Expected learning outcomes include:* *– O 1 - Describe the principle of operation using scientific concepts, theories and methods and test the results in the design and application of devices, devices and systems of electronics*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– PC 2 - Ability to perform analysis of the subject area and regulatory documentation required for the design and application of devices, devices, components and electronics systems* *– PC 3 - Ability to integrate knowledge of fundamental sections of physics and chemistry to understand the processes of solid-state, functional, quantum and energy electronics, electrical engineering, field theory* *– PC 12 - Ability to develop working technical documentation, design work with verification of compliance with standards, specifications and other regulations*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical, Laboratory*
End-of-semester control	*Exam*

Term Paper in Nonlinear Electric Circuits and Transient Processes	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*1*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Analytic Geometry", "Physics", "Personal Computers and Fundamentals of Programming")*
Scope of the course	*The scope of the course includes study of the basic properties, laws and methods of calculation of nonlinear electric circuits and transients in linear electric circuits. In the process of studying students get acquainted with the basic elements of nonlinear electrical circuits, their parameters and characteristics, analyze the processes in electrical circuits and study the methods of their analysis and calculation.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- work with reference and educational literature;* *- preparation of initial data for programs of calculations of linear and nonlinear electric circuits in constant and transient modes;* *- acquisition of skills in using modern software to perform calculations.*
Learning outcomes	*Expected learning outcomes include:* *– O 1 - Describe the principle of operation using scientific concepts, theories and methods and test the results in the design and application of devices, devices and systems of electronics*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– PC 2 - Ability to perform analysis of the subject area and regulatory documentation required for the design and application of devices, devices, components and electronics systems* *– PC 3 - Ability to integrate knowledge of fundamental sections of physics and chemistry to understand the processes of solid-state, functional, quantum and energy electronics, electrical engineering, field theory* *– PC 12 - Ability to develop working technical documentation, design work with verification of compliance with standards, specifications and other regulations*
Instructional Materials	*syllabus*
Mode of delivery	*tutorials*
End-of-semester control	*Final test*

Theory of Information	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Analytic Geometry", "Informatics I. Personal Computers and Fundamentals of Programming", "Informatics II. Programming and Algorithmic Languages")*
Scope of the course	*The scope of the course includes formation of students' ability to analyze the parameters of electrical signals and coordinate them with the parameters of the communication channel and transceiver equipment, the ability to choose effective coding methods to ensure the transmission of information in high-speed communication systems and without distortion, the ability to apply the acquired theoretical knowledge of information theory and coding theory for the design of real electronic information systems and communication systems.*
Rationale	*The educational component contributes to the development of professional expertise in:* *1) use of theoretical knowledge for analysis and synthesis of coding and decoding electronic systems, processing of measurement results in information systems, finding optimal coding methods for specific electronic systems.* *2) performing technical analysis and obtaining the best solution when choosing the option of building digital and analog electronic systems, the use of modern natural, efficient and noise-tolerant codes in the design of electronic systems and communication systems.*
Learning outcomes	*Expected learning outcomes include:* *– O 2 - Apply knowledge and understanding of differential and integral calculus, algebra, functional analysis of real and complex variables, vectors and matrices, vector calculus, differential equations in ordinary and partial derivatives, Fourier series, statistical analysis, information theory, numerical methods, basics of automatic theory regulation to solve theoretical and applied problems of electronics*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to apply knowledge in practical situations* *– GC 5 - Skills in the use of information and communication technologies* *– GC 7 - Ability to search, process and analyze information from various sources*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Final test*

Information Technologies	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Analytic Geometry", "Fundamentals of Probabilistic Data Processing", "Informatics I. Personal Computers and Fundamentals of Programming", "Informatics II. Programming and Algorithmic Languages")*
Scope of the course	*The scope of the course includes basic thorough knowledge of methods, methods and algorithms for using the MATLAB software package to solve applied problems in mathematics, electronics, circuitry, analysis and synthesis of electronic circuits and systems.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- adequate choice of methods for using the software package MATLAB and SIMULINK to solve specific applications;* *- analysis of the obtained results in terms of their reliability;* *- estimates of calculation errors that occur at different stages of using the software package MATLAB and SIMULINK;* *- work independently with scientific and technical literature;* *- to use the acquired knowledge when performing engineering and scientific calculations in solving problems of electronics.*
Learning outcomes	*Expected learning outcomes include:* *– O 4 - Evaluate the characteristics and parameters of electronic materials, understand the basics of solid-state, functional, quantum and power electronics, electrical engineering, analog and digital circuitry, converter and microprocessor technology*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 6 - Ability to learn and master modern knowledge*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Electronic Systems for Operation and Control	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Power Converters", "Theory of Electrical Circuits")*
Scope of the course	*The scope of the course includes:* *- the principle of calculating discrete transmission characteristics;* *- features of use of digital and analog sensors;* *- principles of synthesis of digital regulators.*
Rationale	*The educational component contributes to the development of professional expertise in* *- calculate the parameters of the regulators;* *- calculate the quality control parameters of regulators;* *- describe control systems in the space of state variables;* *- calculate parameters and choose devices for designing system nodes management;* *- independent work with educational, educational and methodical and reference literature.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 5 - Ensure energy and economic efficiency of development, production and operation of electronic equipment.* *– R 10 -Choose the best research methods, modify, adapt and develop new methods.* *– R 12 - To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 7 - Ability to solve problems of processing and displaying information in modern electronic systems.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical, Laboratory*
End-of-semester control	*Exam*

Course Project in Electronic Systems for Operation and Control	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*1,5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Power Converters", "Theory of Electrical Circuits")*
Scope of the course	*The scope of the course includes:* *- the principle of calculating discrete transmission characteristics;* *- features of use of digital and analog sensors;* *- principles of synthesis of digital regulators.*
Rationale	*The educational component contributes to the development of professional expertise in* *- calculate the parameters of the regulators;* *- calculate the quality control parameters of regulators;* *- describe control systems in the space of state variables;* *- calculate parameters and choose devices for designing system nodes management;* *- independent work with educational, educational and methodical and reference literature.*
Learning outcomes	*Expected learning outcomes include:* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 6 - Ensure professional development of team members taking into account the world level of scientific and engineering achievements in the field of development and operation of electronic systems.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 7 - Ability to solve problems of processing and displaying information in modern electronic systems.*
Instructional Materials	*syllabus*
Mode of delivery	*tutorials*
End-of-semester control	Final test

Fundamentals of Automatic Control Theory	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*6*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical Analysis", "Calculus", "Information technology")*
Scope of the course	*The scope of the course includes:* *- on the peculiarities of the use of basic methods and the scope of machine learning;* *- teaching methods with and without a teacher;* *- organization of training with reinforcement.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- choosing an effective method for solving a given problem in the field of artificial intelligence;* *- programming of basic methods of machine learning;* *- control and organization of the correctness of the machine learning process.*
Learning outcomes	*Expected learning outcomes include:* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 5 - Ensure energy and economic efficiency of development, production and operation of electronic equipment.* *– R 10 -Choose the best research methods, modify, adapt and develop new methods.* *– R 12 - To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 8 - Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic systems, to formulate proposals for solving problems.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Exam*

Power Electronic Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Analog Circuit Design", "Power Converters", "Microprocessor-based Devices")*
Scope of the course	*The scope of the course includes acquaintance with schemes and principles of work of converting systems, with methods of regulation and formation of output voltage, The main features and areas of application of conversion systems are considered.*
Rationale	*The educational component contributes to the development of professional expertise in principles of operation and skills of complete design of feedback inverter circuits and full simulation of their operation; features of real keys, drivers, microcontrollers and operational amplifiers.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 5 - Ensure energy and economic efficiency of development, production and operation of electronic equipment.* *– R 8 - Carry out and coordinate the development, selection, use and modernization of the necessary equipment, tools and methods in the organization of the production process, taking into account technical and technological capabilities, modern science-intensive methods, tools and technical solutions.* *– R 12 - To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 2 - Ability to plan and implement innovative projects in the field of electronics, protect intellectual property rights.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– PC 8 - Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic systems, to formulate proposals for solving problems.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Exam*

Power Supply Systems of Electronic Equipment	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Theory of Electrical Circuits", "Electromagnetic Engineering", "Power Electronics", "Power Electronic Systems", "Power Converters", "Design and Technology of Electronic Devices and Systems")*
Scope of the course	*The scope of the course includes:* *- principles of stabilization of output voltage in single-channel and multi-channel systems;* *- methods of reducing the mass and size of PEE EE;* *- methods to increase the reliability of PEE EE;* *- new element base and modern approaches to the construction of PEE EE.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- calculation and design of semiconductor converters of electric energy;* *- study of typical topologies of power supply systems;* *- study of modes of operation of electricity converters and their functional units.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 5 - Ensure energy and economic efficiency of development, production and operation of electronic equipment.* *– R 14 - Investigate processes in electronic systems using modern experimental methods and equipment, computer modeling methods, perform statistical processing and analysis of experimental results and calculations.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 7 - Ability to solve problems of processing and displaying information in modern electronic systems.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Scientific Research I. Fundamentals of Scientific Research

Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*2*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components of First level (Bachelor's degree), successful defense of a qualifying diploma project and awarding a bachelor's degree)*
Scope of the course	*The scope of the course includes acquisition of relevant knowledge, skills, abilities and experience aimed at forming an integrated competence of the graduate - the ability to solve complex specialized problems and practical problems of professional activity in the field of electronics and / or in the learning process involving research and / or innovation in the field electronics and is characterized by complexity and uncertainty of conditions and requirements.*
Rationale	*The educational component contributes to the development of professional expertise in: to carry out scientific search of literary sources and security documents in the field of professional orientation and to obtain practical skills of writing scientific articles in professional scientific publications, including those included in world scientometric databases; apply in research modern information technologies, software, programming languages and computer-aided design tools, have skills in using software and working in computer networks, be able to use Internet resources, distance learning platforms, various educational environments, databases and depositories; conduct research, evaluate results and present them to the scientific community.*
Learning outcomes	*Expected learning outcomes include: – R 3 - To cooperate with the customer in the formulation of the technical task and discussion of technical solutions and results of projects, to lead a reasoned professional and scientific discussion. – R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources. – R 6 - Ensure professional development of team members taking into account the world level of scientific and engineering achievements in the field of development and operation of electronic systems. – R 7 - Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information; critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience. – R 8 - Carry out and coordinate the development, selection, use and modernization of the necessary equipment, tools and methods in the organization of the production process, taking into account technical and technological capabilities, modern science-intensive methods, tools and technical solutions. – R 9 - Coordinate the work of teams of performers in the field of research, design, development, analysis, calculation, modeling, production and testing of electronic devices and systems. – R 10 - Choose the best research methods, modify, adapt and develop new methods. – R 11 - Analyze technical and economic indicators, reliability, ergonomics, patent purity, market requirements, investment climate and compliance of design solutions, research and development with certain goals and norms of the legislation of Ukraine.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to: – GC 1 - Ability to abstract thinking, analysis and synthesis. – GC 2 - Ability to communicate in the state language both orally and in writing. – GC 4 - Ability to perform research at the appropriate level. – GC 6 - Ability to generate new ideas (creativity). – PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions. – PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems. – PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it. – PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness. – PC 11 - Ability to plan and perform research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Final test*

Scientific Research II. Research Work on Master Thesis Subject

Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*2*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components of First level (Bachelor's degree), successful defense of a qualifying diploma project and awarding a bachelor's degree)*
Scope of the course	*The scope of the course includes formation of students' abilities to conduct research in electronics in order to create new scientific knowledge and results.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- apply in scientific practice mathematical, scientific and technical methods, means of automated and automatic design, as well as computer programs for research of electronic devices, devices and systems;* *- use in scientific practice the creative and innovative potential for research and synthesis of solutions;* *- to apply in scientific practice modern information technologies and computer software;* *- apply in scientific practice the skills of working with electronic measuring instruments and automated diagnostic computer control and measuring systems; - to ensure the improvement of computer literacy and to promote the practice of using modern software, information and communication technologies in professional teams, working and research groups engaged in research and development of electronic devices, devices and systems;* *- apply modern information technologies, software, programming languages and computer design tools in research, have the skills to use software and work in computer networks, be able to create databases and use Internet resources.*
Learning outcomes	*Expected learning outcomes include:* *– R 3 - To cooperate with the customer in the formulation of the technical task and discussion of technical solutions and results of projects, to lead a reasoned professional and scientific discussion.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 6 - Ensure professional development of team members taking into account the world level of scientific and engineering achievements in the field of development and operation of electronic systems.* *– R 7 - Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information; critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience* *– R 8 - Carry out and coordinate the development, selection, use and modernization of the necessary equipment, tools and methods in the organization of the production process, taking into account technical and technological capabilities, modern science-intensive methods, tools and technical solutions.* *– R 9 - Coordinate the work of teams of performers in the field of research, design, development, analysis, calculation, modeling, production and testing of electronic devices and systems.* *– R 10 - Choose the best research methods, modify, adapt and develop new methods.* *– R 11 - Analyze technical and economic indicators, reliability, ergonomics, patent purity, market requirements, investment climate and compliance of design solutions, research and development with certain goals and norms of the legislation of Ukraine.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– GC 4 - Ability to perform research at the appropriate level.* *– GC 6 - Ability to generate new ideas (creativity).* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.* *– PC 11 - Ability to plan and perform research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations.*
Instructional Materials	*syllabus*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Final test*

Specialized and Industrial Microprocessor Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Microprocessor-based Devices", "Microprocessor Technology", "Digital Information Systems", "Personal Computers")*
Scope of the course	*The scope of the course includes study of the principles of operation and means of designing multimicrocontroller systems and systems with computers.*
Rationale	*The educational component contributes to the development of professional expertise aimed at forming the integrated competence of the graduate - the ability to solve complex specialized problems and practical problems of developing multiprocessor systems based on on-board and industrial computers, including distributed multimicrocontroller systems and industrial systems for various purposes, e.g. wireless control of pump station frequency converters, control of lighting systems and microsatellite systems.*
Learning outcomes	*Expected learning outcomes include:* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– R 7 - Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information; critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Exam*

Microprocessor Systems Based on ARM Processors	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Microprocessor-based Devices", "Microprocessor Technology", "Digital Information Systems", "Personal Computers")*
Scope of the course	*The scope of the course includes^* *- Design of devices based on ARM processors;* *- Mastering modern methods of developing distributed microcontroller systems.*
Rationale	*The educational component contributes to the development of professional expertise aimed at the formation of integrated competence of the graduate - the ability to solve complex specialized problems and practical problems of developing systems based on ARM processors.*
Learning outcomes	*Expected learning outcomes include:* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– R 7 - Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information; critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Exam*

Display and Data Recording Devices	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Analog Circuit Design", "Digital Circuit Design", "Personal Computers and Fundamentals of Programming", "Electronic Systems", "Microprocessor Technology")*
Scope of the course	*The scope of the course includes study of the principles of construction and operation of information display and registration devices, acquisition of practical skills of work with them and acquaintance with the basics of their design.*
Rationale	*The educational component contributes to the development of professional expertise in develop control and analysis systems for display, recording and data transmission devices.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– R 7 - Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information; critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience.* *– PC 8 - Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic systems, to formulate proposals for solving problems..*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Information Visualization and Detection Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Analog Circuit Design", "Digital Circuit Design", "Personal Computers and Fundamentals of Programming", "Electronic Systems", "Microprocessor Technology")*
Scope of the course	*The scope of the course includes study of the principles of construction and operation of information visualization and detection systems, acquisition of practical skills to work with them and acquaintance with the basics of their design*
Rationale	*The educational component contributes to the development of professional expertise in develop control and analysis systems for display, recording and data transmission devices.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– R 7 - Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information; critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience.* *– PC 8 - Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic systems, to formulate proposals for solving problems..*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Components of Electronic Control Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Power electronics and signal processing")*
Scope of the course	*The scope of the course includes knowledge about modern principles of construction of devices of converting equipment and their separate knots, the analysis of models of electronic components and the account of their parameters about designing of converters.*
Rationale	*The educational component contributes to the development of professional expertise in the design and calculation of specialized power converters, the choice of topology of converters and the type of individual components in accordance with the input data of the calculation.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– GC 5 - Ability to search, process and analyze information from various sources.* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Exam*

Specialized Power Electronic Devices and Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Power electronics and signal processing")*
Scope of the course	*The scope of the course includes to get acquainted with new achievements and developments in the field of power electronics. In the process of studying the discipline, students get acquainted with modern principles of construction of devices of power converting technique and their separate components, modern methods of their analysis, calculation and design.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions;* *- ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems;* *- ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 2 - Model and experimentally study phenomena and processes in electronic devices and systems, in technologies of the electronic industry.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– GC 5 - Ability to search, process and analyze information from various sources.* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Exam*

Design and Technology of Electronic Devices and Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Electronic control systems and regulation", "Mathematical modeling of systems and processes", "The basics of self-regulation theory")*
Scope of the course	*The scope of the course includes modern means of design. Stages of design. Design of printed circuit boards. Materials for the manufacture of boards for the purpose. Technology of manufacturing units and blocks of electronic modules.*
Rationale	*The educational component contributes to the development of professional expertise in ability to gain knowledge and skills for the manufacture of electronic devices from start to finish, the creation of robot technical components and the element base of electronic equipment for various purposes. The training course is based on a modern platform for the development of electronic and printed circuit boards Altium Designer. Aimed at development, creation, production and application.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 8 - Carry out and coordinate the development, selection, use and modernization of the necessary equipment, tools and methods in the organization of the production process, taking into account technical and technological capabilities, modern science-intensive methods, tools and technical solutions.* *– R 12 - To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects.* *– R 13 - Organize and manage research, innovation and investment activities, business projects and production processes taking into account technical, technological and economic factors.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– GC 5 - Ability to search, process and analyze information from various sources.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 8 - Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic systems, to formulate proposals for solving problems.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical, Laboratory*
End-of-semester control	*Exam*

Design of Robotic Electronic Systems	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Electronic control systems and regulation", "Mathematical modeling of systems and processes", "The basics of self-regulation theory")*
Scope of the course	*The scope of the course includes modern means of design, development and construction of robotic electronic systems and devices. Selection of components for development, study of their functionality and purpose. Stages of creation - from the design of printed circuit boards to the manufacture of an existing device. Selection of materials, the process of manufacturing the board, supporting documentation, design environment Altium designer, modern microcontroller devices, layout or implementation in the existing system or the manufacture of a separate operating device.*
Rationale	*The educational component contributes to the development of professional expertise in the design and construction of robotic sensors and control systems. Design and construction experience is as important as conceptual understanding. Therefore, this is a practical course. Each concept follows several schemes for design and construction, so that your confidence and understanding will have a solid foundation in actual skills. The training course is built on a modern platform for the development of electronic and printed circuit boards Altium Designer. Aimed at development, creation, production and application.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 8 - Carry out and coordinate the development, selection, use and modernization of the necessary equipment, tools and methods in the organization of the production process, taking into account technical and technological capabilities, modern science-intensive methods, tools and technical solutions.* *– R 12 - To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects.* *– R 13 - Organize and manage research, innovation and investment activities, business projects and production processes taking into account technical, technological and economic factors.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– GC 5 - Ability to search, process and analyze information from various sources.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 8 - Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic systems, to formulate proposals for solving problems.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical, Laboratory*
End-of-semester control	*Exam*

Internet of Things Technology in Electronics	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Analog Circuit Design", "Digital Circuit Design", "Personal Computers and Fundamentals of Programming", "Electronic Systems", "Microprocessor Technology")*
Scope of the course	*The scope of the course includes:* *- Computer networks,* *- Modern platforms for building systems with microcontrollers,* *- Use of digital communication systems,* *- Use of cloud technologies.*
Rationale	*The educational component contributes to the development of professional expertise in to build a system for solving distributed problems with the ability to manage and monitor via the Internet*
Learning outcomes	*Expected learning outcomes include:* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– PC 7 - Ability to solve problems of processing and displaying information in modern electronic systems.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Internet Technology in Industry	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Analog Circuit Design", "Digital Circuit Design", "Personal Computers and Fundamentals of Programming", "Electronic Systems", "Microprocessor Technology")*
Scope of the course	*The scope of the course includes:* *- General information about the information transmission system.* *- Modern information transmission systems.* *- Computer networks.* *- Internet and its technologies.* *- Wireless networks for telemetry transmission and scheduling.* *- Industrial automation platforms.* *- Use of cloud platforms for storage and processing information.*
Rationale	*The educational component contributes to the development of professional expertise in Automated scheduling and monitoring systems (SCADA-systems, Supervisory Control and Data Acquisition - remote control and data collection)*
Learning outcomes	*Expected learning outcomes include:* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 - Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.* *– PC 7 - Ability to solve problems of processing and displaying information in modern electronic systems.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Mathematical Modeling of Systems and Processes	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components of First level (Bachelor's degree))*
Scope of the course	*The scope of the course includes formation of students' methodology, general principles, content and structure of scientific research of physical processes, electronic devices, devices and electronic systems through the study, assimilation and use of methods and tools of theoretical and experimental research.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- apply in scientific practice mathematical, scientific and technical methods, automatic design tools and computer programs for the development of electronic devices, devices and systems;* *- use in scientific practice the creative and innovative potential for the synthesis of solutions and for the development of electronic devices, devices and systems, including primary converters, amplifiers, analog and digital devices, pulse technology and other devices;* *- apply in scientific practice modern information technologies and computer software for the development of electronic devices, devices and systems;* *- apply in scientific practice the skills of working with electronic measuring instruments and automated diagnostic computer control and measuring systems; - to ensure the improvement of computer literacy and to promote the practice of using modern software, information and communication technologies in professional teams, working and research groups engaged in research and development of electronic devices, devices and systems;* *- apply modern information technologies, software, programming languages and computer design tools in research, have the skills to use software and work in computer networks, be able to create databases and use Internet resources.*
Learning outcomes	*Expected learning outcomes include:* *– R 6 - Ensure professional development of team members taking into account the world level of scientific and engineering achievements in the field of development and operation of electronic systems.* *– R 14 - Investigate processes in electronic systems using modern experimental methods and equipment, computer modeling methods, perform statistical processing and analysis of experimental results and calculations.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 -Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 11 - Ability to plan and perform research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Exam*

Supplementary Topics of Information Electronics	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*6*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Circuit Design", "Information Technologies", "Theory of Information", "Digital Information Systems", "Microprocessor Technology", "Electronic Systems", "Electronic Systems for Operation and Control")*
Scope of the course	*The scope of the course includes formation of the appropriate level of knowledge and ability to use basic knowledge about methods and means of creating digital devices based on programmable logic matrices.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- independently work with reference scientific and technical literature, search Internet resources to acquire new knowledge on programmable logic matrices;* *- use the acquired knowledge in the development of digital devices based on programmable logic matrices;* *- choose existing types of programmable logic matrices according to the acquired knowledge.*
Learning outcomes	*Expected learning outcomes include:* *– R 1 - Implement projects for modernization of production and technologies in the field of electronics, introduction of the latest information and communication technologies, multimedia.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 14 - Investigate processes in electronic systems using modern experimental methods and equipment, computer modeling methods, perform statistical processing and analysis of experimental results and calculations.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 -Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 11 - Ability to plan and perform research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Exam*

Course Project in Supplementary Topics of Information Electronics	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*1.5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Circuit Design", "Information Technologies", "Theory of Information", "Digital Information Systems", "Microprocessor Technology", "Electronic Systems", "Electronic Systems for Operation and Control")*
Scope of the course	*The scope of the course includes formation of the appropriate level of knowledge and ability to use basic knowledge about methods and means of creating digital devices based on programmable logic matrices.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- independently work with reference scientific and technical literature, search Internet resources to acquire new knowledge on programmable logic matrices;* *- use the acquired knowledge in the development of digital devices based on programmable logic matrices;* *- choose existing types of programmable logic matrices according to the acquired knowledge.*
Learning outcomes	*Expected learning outcomes include:* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 6 - Ensure professional development of team members taking into account the world level of scientific and engineering achievements in the field of development and operation of electronic systems.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 5 - Ability to search, process and analyze information from various sources.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 -Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 8 - Ability to assess problem situations in the field of development, design, tune-up, functioning and operation of electronic systems, to formulate proposals for solving problems.*
Instructional Materials	*syllabus*
Mode of delivery	*tutorials*
End-of-semester control	*Final test*

Scientific Research II. Research Work on Master Thesis Subject	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*3.5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational components of First level (Bachelor's degree))*
Scope of the course	*The scope of the course includes formation of students' abilities to conduct research in electronics in order to create new scientific knowledge and results.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- apply in scientific practice mathematical, scientific and technical methods, means of automated and automatic design, as well as computer programs for research of electronic devices, devices and systems;* *- use in scientific practice the creative and innovative potential for research and synthesis of solutions;* *- to apply in scientific practice modern information technologies and computer software;* *- apply in scientific practice the skills of working with electronic measuring instruments and automated diagnostic computer control and measuring systems; - to ensure the improvement of computer literacy and to promote the practice of using modern software, information and communication technologies in professional teams, working and research groups engaged in research and development of electronic devices, devices and systems;* *- apply modern information technologies, software, programming languages and computer design tools in research, have the skills to use software and work in computer networks, be able to create databases and use Internet resources.*
Learning outcomes	*Expected learning outcomes include:* *– R 3 - To cooperate with the customer in the formulation of the technical task and discussion of technical solutions and results of projects, to lead a reasoned professional and scientific discussion.* *– R 4 - Develop low-waste, energy-saving and environmentally friendly technologies taking into account the requirements of human safety, rational use of raw materials, energy and other resources.* *– R 6 - Ensure professional development of team members taking into account the world level of scientific and engineering achievements in the field of development and operation of electronic systems.* *– R 7 - Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information; critically comprehend and interpret existing knowledge and data, form directions of research and development taking into account domestic and foreign experience* *– R 8 - Carry out and coordinate the development, selection, use and modernization of the necessary equipment, tools and methods in the organization of the production process, taking into account technical and technological capabilities, modern science-intensive methods, tools and technical solutions.* *– R 9 - Coordinate the work of teams of performers in the field of research, design, development, analysis, calculation, modeling, production and testing of electronic devices and systems.* *– R 10 - Choose the best research methods, modify, adapt and develop new methods.* *– R 11 - Analyze technical and economic indicators, reliability, ergonomics, patent purity, market requirements, investment climate and compliance of design solutions, research and development with certain goals and norms of the legislation of Ukraine.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– GC 4 - Ability to perform research at the appropriate level.* *– GC 6 - Ability to generate new ideas (creativity).* *– PC 1 - Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 6 - Ability to find the necessary information with the help of modern information resources, analyze and evaluate it.* *– PC 9 - Ability to take into account in design and technological, engineering and scientific and technical solutions requirements for safety of life, protection of intellectual property, energy efficiency and environmental friendliness.* *– PC 11 - Ability to plan and perform research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations.*
Instructional Materials	*syllabus*
Mode of delivery	*tutorials*
End-of-semester control	*Final test*

Fundamentals of Machine Learning	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*3.5*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Mathematical analysis", "Calculus", "Information technology")*
Scope of the course	*The scope of the course includes knowledge:* *- on the peculiarities of the use of basic methods and the scope of machine learning;* *- teaching methods with and without a teacher;* *- organization of training with reinforcement.*
Rationale	*The educational component contributes to the development of professional expertise in:* *• ability to plan and conduct research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations;* *• ability to acquire modern scientific knowledge of the latest developments in computer and microprocessor technology, software and hardware for information visualization and apply them to solve scientific and technical problems;* *• ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems. As a result of studying the materials of the module the student should receive*
Learning outcomes	*Expected learning outcomes include:* *– R 5 - Ensure energy and economic efficiency of development, production and operation of electronic equipment.* *– R 12 - To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects.* *– R 14 - Investigate processes in electronic systems using modern experimental methods and equipment, computer modeling methods, perform statistical processing and analysis of experimental results and calculations.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 -Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 7 - Ability to solve problems of processing and displaying information in modern electronic systems.* *– PC 11 - Ability to plan and perform research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Laboratory*
End-of-semester control	*Final test*

Modern trends in Computer and Microprocessor Technology	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Electronic Devices and Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Microprocessor Technology", "Microprocessor-based Devices")*
Scope of the course	*The scope of the course includes:* *- main trends in the development of computer and microprocessor technology;* *- general principles of construction and operation of the latest computer and microcontroller systems;* *- methods and means of hardware development and software for systems with microprocessors and computers.*
Rationale	*The educational component contributes to the development of professional expertise in:* *- independently work with scientific and technical literature on microprocessor and computer systems for various purposes;* *- to conduct a comparative analysis of different architectures and microprocessors (microcontrollers),* *- have practical skills in choosing the element base of microcontrollers and control platforms* *- use the acquired knowledge in the design and construction of new computer and microprocessor systems* *- develop software for computer and microprocessor systems.*
Learning outcomes	*Expected learning outcomes include:* *– R 5 - Ensure energy and economic efficiency of development, production and operation of electronic equipment.* *– R 12 - To generalize modern scientific knowledge in the field of electronics and apply them to solve complex scientific and technical problems, bringing the obtained solutions to the level of competitive developments, implementation of results in business projects.* *– R 14 - Investigate processes in electronic systems using modern experimental methods and equipment, computer modeling methods, perform statistical processing and analysis of experimental results and calculations.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– GC 1 - Ability to abstract thinking, analysis and synthesis.* *– GC 2 - Ability to communicate in the state language both orally and in writing.* *– PC 3 - Ability to systematically solve problems of development, analysis, calculation, modeling of electronic power, information, control and multimedia systems.* *– PC 4 -Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic systems.* *– PC 5 - Ability to ensure the efficiency and quality of measurements in electronic systems.*
Instructional Materials	*syllabus, learning materials (lecture notes etc)*
Mode of delivery	*Lectures, Practical*
End-of-semester control	*Final test*

Computational Mathematics

Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*3*
Language of study	*English*
Department	*Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2* *- Mathematical Analysis* *- Analytical Geometry* *- Informatics*
Scope of the course	*The purpose of studying this course is to acquire theoretical and practical knowledge of computational mathematics, which allows students to form knowledge of the rules of the most effective or optimal solution of mathematical modeling problems.*
Rationale	*The task of computational mathematics is to find a generalized solution of the equations that make up the mathematical model, specifying specific numerical values by constants in equations corresponding to invariant quantities. If it is possible to find such a generalized theoretical solution, it becomes possible to investigate the values of these parameters, which ensured the maximum adequacy of the model (technical object).* *Modern computational mathematics consists of many sections, the most important of which are the calculation and interpolation of functions, computational methods of linear algebra, numerical methods for solving algebraic and transcendental equations, numerical differentiation and integration, numerical solution of differential and integrated equations, methods in which study numerous ways to find extreme values of functionals.*
Learning outcomes	*The purpose of the discipline is the formation of students' competencies:* *GC5. Skills in the use of information and communication technologies.* *GC9 Ability to work in a team.* *GC10 Implementation of safe activities.* *GC14 Ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, techniques and technologies. active recreation and a healthy lifestyle.* *SC5. Ability to apply appropriate mathematical, scientific and technical methods, modern information technology and computer software, skills in working with computer networks, databases and Internet resources to solve engineering problems in the field of electronics.*
Competencies and skills	*Program learning outcomes provided in the educational program of the specialty 171 Electronics:* *R5. Use information and communication technologies, applied and specialized software products to solve problems of design and debugging of electronic systems, demonstrate skills of programming, analysis and display of measurement and control results* *R18. Apply methods of mathematical modeling and optimization of electronic systems for the development of automated and robotic production systems*
Instructional Materials	*syllabus, learning materials (presentation)*
Mode of delivery	*Lectures, praticesc*
End-of-semester control	*Test*

PHYSICAL FUNDAMENTALS OF ELECTRONICS

Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	First level (Bachelor's degree)
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component "Physics", "Mathematical Analysis" and "Measurement Techniques", is closely related to the "Theory of Electrical Circuits")*
Scope of the course	*The scope is the basis for further study of "Circuits"*
Rationale	*The discipline "Physical Fundamentals of Electronics" is essential in the formation of professional knowledge and skills of bachelors who master the specialty 171 Electronics in educational programs "Acoustic electronic systems and acoustic information processing technologies" and "Electronic multimedia systems and the Internet of Things".* *The subject of the discipline - physical bases of construction and functioning of basic semiconductor, acousto- and piezoelectronic devices, methods of calculation and measurement of their characteristics and electrical parameters.*
Learning outcomes	*Expected learning outcomes include:* *P1. Describe the principle of operation using scientific concepts, theories and methods and verify the results in the design and application of devices, devices and electronics systems.* *P3. Find solutions to practical problems of electronics by applying appropriate models and theories of electrodynamics, analytical mechanics, electromagnetism, statistical physics, solid state physics.* *P4. Evaluate the characteristics and parameters of electronic materials, understand the basics of solid-state electronics, electrical engineering, analog and digital circuitry, converter and microprocessor technology.* *P5. Use information and communication technologies, applied and specialized software products to solve problems of design and debugging of electronic systems, demonstrate programming skills, analysis and display of measurement and control results.* *P6. Apply experimental skills (knowledge of experimental methods and procedures for conducting experiments) to test hypotheses and study the phenomena of electronics, be able to use standard equipment, plan, draw diagrams, analyze, model and critically evaluate the results.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *SC1. Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices and systems of electronics.* *SC2. Ability to perform analysis of the subject area and regulatory documentation required for the design and application of devices, devices and electronics systems.* *SC3. Ability to integrate knowledge of fundamental sections of physics and chemistry to understand the processes of solid-state, functional and power electronics, electrical engineering.* *SC5. Ability to apply appropriate mathematical, scientific and technical methods, modern information technology and computer software, skills in working with computer networks, databases and Internet resources to solve engineering problems in the field of electronics.* *SC6. Ability to identify, classify, evaluate and describe processes in electronics devices, devices and systems using analytical methods, modeling tools, prototypes and experimental results.* *SC9. Ability to determine and evaluate the characteristics and parameters of materials of electronic equipment, analog and digital electronic devices for the design of microprocessor and electronic systems.*
Instructional Materials	*syllabus, learning materials (textbook, tutorials)*
Mode of delivery	*lectures, laboratory works*
End-of-semester control	*Exam*

The Probabilistic Basics of Data Proccesing	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2* *- Mathematical Analysis* *- Analytical Geometry* *- Informatics*
Scope of the course	*The scope of the course includes 150 hours*
Rationale	*The educational component "Probabilistic bases of data processing" studies the fundamental sections of mathematics, which studies the patterns of random phenomena. The course provides knowledge of the basics of probability theory, the theory of random variables and mathematical statistics. It allows you to gain practical skills in calculating the probabilities of complex events using axioms and theorems of probability theory, on the analysis and description of random variables, including in limit cases, on the analysis of stochastic dependence and to expand the mathematical culture associated with randomness and uncertainty..*
Learning outcomes	*Students will possess abstract mathematical thinking, mathematical culture and scientific worldview, semantics, methods, practical skills and theoretical provisions of probability theory and mathematical statistics, which are necessary for the future specialist to conducting research within the framework of professional activity and mastering special disciplines.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *GC 6. Ability to learn and master modern knowledge.* *SC1. Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices and systems of electronics.* *SC5. Ability to apply appropriate mathematical, scientific and technical methods, modern information technology and computer software, skills in working with computer networks, databases and Internet resources to solve engineering problems in the field of electronics* *SC6. Ability to identify, classify, evaluate and describe processes in electronics devices, devices and systems using analytical methods, modeling tools, prototypes and experimental results*
Instructional Materials	*syllabus, learning materials -reference book, handbook, video lectures*
Mode of delivery	*Lectures, workshops /tutorials)*
End-of-semester control	*Test*

Fundamentals of Non-Destructive Testing

Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2* *- Theoretical foundations of acoustics* *- Electroacoustic transducers* *- Applied mechanics* *- Physics* *- Mathematical analysis* *- Analytical geometry*
Scope of the course	*The nature and development of defects. Physical features of influence of defects on various fields, in particular: magnetic, acoustic, radiation and others. Methods of detecting defects of different nature and location are considered*
Rationale	*The operation of any device, tool, equipment depends on their integrity and quality of production. The presence of defects affects the ability to use the devices and safety for the user. Quality control is mandatory not only during production, but also during operation of products.*
Learning outcomes	*According to OPP "Acoustic electronic systems and technologies of acoustic information processing" the student will improve the knowledge provided in the standard of specialty 171 Electronics as:* *GC4. Knowledge of international standards in the field of electronics, methods of quality assurance of electronic devices and systems.* *GC8. Knowledge of the structure of matter, basic physical and chemical processes and phenomena on which the functioning of electronic devices and systems is based.* *GC11. Knowledge of means of measuring the characteristics of materials and devices of electronics, their adjustment and diagnostics, modern technologies for obtaining materials, production of components and devices of electronic equipment.*
Competencies and skills	*The student will consolidate and improve their special competencies and skills provided in specialty standard 171 Electronics:* *SC1. Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices and systems of electronics.* *SC6. Ability to identify, classify, evaluate and describe processes in electronics devices, devices and systems using analytical methods, modeling tools, prototypes and experimental results.* *SC9. Ability to determine and evaluate the characteristics and parameters of materials of electronic equipment, analog and digital electronic devices for the design of microprocessor and electronic systems.* *SC10. Ability to apply in practice industry standards and quality standards of functioning of devices and systems of electronics.* *SC 11. Ability to monitor and diagnose the condition of equipment, use modern electronic components and hardware, perform maintenance, repair and maintenance of electronic devices and systems, install, configure and repair analog, digital and optical modules, develop and manufacture printed circuit boards, develop software for microcontrollers*
Instructional Materials	*syllabus, learning materials (presentation)*
Mode of delivery	*lectures*
End-of-semester control	*Test*

Fundamentals of Defectology	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*First level (Bachelor's degree)*
Year of study	*3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2* *- Theoretical foundations of acoustics* *- Electroacoustic transducers* *- Applied mechanics* *- Physics* *- Mathematical analysis* *- Analytical geometry*
Scope of the course	*The nature and development of defects. Influence of defects on the operation of devices in the field of electronics. Requirements for product quality assurance*
Rationale	*The process of production and operation of electronics products is not possible without different levels of product quality control procedures. The quality of the product is not only satisfied with the functional purpose of the device, but also maintaining the health of the user*
Learning outcomes	*According to OPP "Acoustic electronic systems and technologies of acoustic information processing" the student will improve the knowledge provided in the standard of specialty 171 Electronics as:* *GC4. Knowledge of international standards in the field of electronics, methods of quality assurance of electronic devices and systems.* *GC8. Knowledge of the structure of matter, basic physical and chemical processes and phenomena on which the functioning of electronic devices and systems is based.* *GC11. Knowledge of means of measuring the characteristics of materials and devices of electronics, their adjustment and diagnostics, modern technologies for obtaining materials, production of components and devices of electronic equipment.*
Competencies and skills	*The student will consolidate and improve their special competencies and skills provided in specialty standard 171 Electronics:* *SC1. Ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of devices, devices and systems of electronics.* *SC6. Ability to identify, classify, evaluate and describe processes in electronics devices, devices and systems using analytical methods, modeling tools, prototypes and experimental results.* *SC9. Ability to determine and evaluate the characteristics and parameters of materials of electronic equipment, analog and digital electronic devices for the design of microprocessor and electronic systems.* *SC10. Ability to apply in practice industry standards and quality standards of functioning of devices and systems of electronics.* *SC 11. Ability to monitor and diagnose the condition of equipment, use modern electronic components and hardware, perform maintenance, repair and maintenance of electronic devices and systems, install, configure and repair analog, digital and optical modules, develop and manufacture printed circuit boards, develop software for microcontrollers*
Instructional Materials	*syllabus, learning materials (presentation)*
Mode of delivery	*lectures*
End-of-semester control	*Test*

Circuitry	
Restrictions (specialty for which the course is offered)	*171 "Electronics"*
Educational level	*First level (Bachelor's degree)*
Year of study	*3*
Number of ECTS credits	*4.5*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component " ")*
Scope of the course	*The scope of the course includes methods of engineering design and research of analog electronic devices*
Rationale	*The educational component contributes to the development of professional expertise in design and research of analog electronic devices used in audio and video technology, technology for processing and transmitting information, Internet of Things systems.*
Learning outcomes	*Principles of design of modern electronic systems, perspective directions of development of their element base; methods and technologies of analysis, synthesis, modeling, calculation and optimization of electronic systems*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *demonstrate and use knowledge of the principles of modern electronic systems design;* – *solve problems of development, optimization and updating of structural units of electronic systems;* – *assess problem situations and shortcomings in the development, design, commissioning, operation and operation of electronic systems, to formulate proposals for solving problems and eliminating shortcomings.*
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Exam*

Special Programming Languages for Embedded Systems	
Restrictions (specialty for which the course is offered)	*171 "Electronics"*
Educational level	*First level (Bachelor's degree)*
Year of study	*3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component " ")*
Scope of the course	*The scope of the course includes C language, programming environments in the C language of microcontrollers for embedded systems with low power consumption. Use of various sensors and peripherals in embedded systems.*
Rationale	*The educational component contributes to the development of professional expertise in a basic training course for an electronics programmer, necessary for the acquisition of practical skills in designing embedded systems on microcontrollers.*
Learning outcomes	*Expected learning outcomes include:* *a set of practical knowledge, skills, abilities necessary for the design of embedded systems, information processing and transmission, Internet of Things*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *show fundamental knowledge of the principles of modern Internet of Things embedded systems design;* – *solve problems of development, optimization and updating of structural units of microcontrollers systems of Internet of Things.*
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

Base of Microprocessor Technology	
Restrictions (specialty for which the course is offered)	*171 "Electronics"*
Educational level	*First level (Bachelor's degree)*
Year of study	*4*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component " ")*
Scope of the course	*The scope of the course includes the main characteristics of microcontrollers and microprocessors, microcontroller programming tools, the basics of operation of Arduino boards and the use of various sensors and peripherals.*
Rationale	*The educational component contributes to the development of professional expertise in design of microcontrollers systems used in audio and video technology, technology for processing and transmitting information, IoT.*
Learning outcomes	*Expected learning outcomes include:* *a set of practical knowledge, skills, abilities necessary for the design of microcontrollers systems, using of various sensors and peripherals*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *design of microcontrollers systems, solve problems of development, optimization and updating of their structural units;* – *demonstrate knowledge of the principles of Arduino based microcontrollers systems design.*
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Exam*

Power Supply and Electromagnetic Compatibility of Multimedia Equipment	
Restrictions (specialty for which the course is offered)	171 Electronics
Educational level	First level (Bachelor's degree)
Year of study	*4*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes 36 hours of lectures, 18 hours of practical works, 81 hours of self-study, settlement graphic work.*
Rationale	*The educational component contributes to the development of professional expertise and competencies on the purpose, principles of technical means and basics of calculating the parameters of technical means of electronic power supplies, without which the normal functioning of electronic equipment is impossible, acquaintance with the physical foundations and features of hardware power supplies for electronic systems, training in the operation of such means*
Learning outcomes	*Expected learning outcomes include:* *General competencies:* *GC 1. Ability to apply knowledge in practical situations.* *GC 2. Ability to understand the subject area and understanding of professional activity.* *GC 6. Ability to learn and master modern knowledge.* *Professional competencies:* *- ability to perform analysis of the subject area and regulatory documentation required for the design and application of devices, devices and systems of electronics (PC2);* *- ability to integrate knowledge of fundamental sections of physics and chemistry to understand the processes of solid-state, functional and power electronics, electrical engineering. (PC3)* *- ability to apply in practice national, industry standards and quality standards of functioning of devices and systems of electronics (PK10)* *- ability to monitor and diagnose the condition of equipment, use modern electronic components and hardware, perform prevention, repair and maintenance of electronic devices and systems, install, configure and repair analogue, digital and optical modules, develop and manufacture printed circuit boards, develop software for microcontrollers. (PK11)*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *KNOWLEDGE:* *- knowledge and understanding of differential and integral calculus, algebra, functional analysis of real and complex variables, vectors and matrices, vector calculus, differential equations in ordinary and partial derivatives, Fourier series, statistical analysis, information theory, numerical methods for solving theoretical and applied tasks of electronics (K2)* *SKILLS:* *- to find solutions to practical problems of electronics by applying appropriate models and theories of electrodynamics, analytical mechanics, electromagnetism, statistical physics, solid state physics (S3);* *- apply experimental skills (knowledge of experimental methods and procedures for conducting experiments) to test hypotheses and study the phenomena of electronics, be able to use standard equipment, plan, make diagrams; analyze, model and critically evaluate the results (S6).* –
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures /workshops*
End-of-semester control	*Exam*

Information Support of Telecommunication Systems	
Restrictions (specialty for which the course is offered)	171 Electronics
Educational level	First level (Bachelor's degree)
Year of study	*4*
Number of ECTS credits	*4.5*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English*
Scope of the course	*The scope of the course includes 135 hours*
Rationale	*The educational component contributes to the development of professional expertise in securing the functionality of information systems for standard models – by the way of implementation of CGI, SSI, introduction of new WEB-supplements on modern platforms for intelligent telecom systems.*
Learning outcomes	*Expected learning outcomes include:* *– Creating new WEB applications.* *- Support and modification of existing WEB applications.* *- Use of modern WEB technology to ensure the workflow of the electronics engineer.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– Choose the most efficient and rational algorithms for the task.* *- Be able to create sites in different environments and place them on the Internet.* *- Maintain, create new and modify existing WEB sites.* *- Use modern WEB technologies to ensure the workflow of the electronics engineer.* *- Provide "visualization" of experimental data.* *- Create documentation describing the program code.* *- Practically apply the acquired knowledge to solve problems of data conversion and analysis in telecommunications systems and networks, in particular communication systems, radio and television.* *–*
Instructional Materials	*syllabus, learning materials -reference book, handbook, video lectures*
Mode of delivery	*Lectures, workshops /tutorials)*
End-of-semester control	*Test*

Acoustic Equipment of Studios and Rooms	
Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*1*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2* *- Theoretical foundations of acoustics* *- Applied acoustics* *- Electroacoustic equipment* *- Theoretical foundations of electronics* *- Probability theory and data processing*
Scope of the course	*What will be studied: Basics of operation of devices for modification, routing and processing of acoustic signals*
Rationale	*Music and speech signals are perceived comfortably by a person under many conditions, including: signal level, its transparency, clarity and others. Technically, to provide a comfortable acoustic signal is the task of sound operators, which they solve with the help of special equipment.*
Learning outcomes	*The purpose of the discipline is the formation of students' competencies:* *GC8. Principles of construction of modern electronic systems, microprocessor control and management systems, perspective directions of development of their element base; methods and technologies of analysis, synthesis, modeling, calculation and optimization of electronic systems;* *GC10. Standards for design, technological training and production of electronic devices and systems; norms and rules of preparation and maintenance of technical documentation*
Competencies and skills	*Program learning outcomes provided in the educational program of the specialty 171 Electronics:* *SC3. Ability to system thinking, solving problems of development, optimization and updating of structural units of electronic power and information systems.* *SC7. Ability to demonstrate and use fundamental knowledge of the principles of construction of modern electronic systems, control and management systems, systems for conversion and storage of electricity, promising areas of development of their element base.* *SC18. Ability to assess problem situations and shortcomings in the development, design, commissioning, operation and operation of electronic systems, to formulate proposals for solving problems and eliminating shortcomings.*
Instructional Materials	*syllabus, learning materials (presentation)*
Mode of delivery	*Lectures, praticesc*
End-of-semester control	*Exam*

Hardware for Wireless Security Systems	
Restrictions (specialty for which the course is offered)	*171 "Electronics"*
Educational level	*Second level /* Master's degree
Year of study	*3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component " ")*
Scope of the course	*The scope of the course includes design of devices on 8 and 32-bit microcontrollers, which have a wireless channel of data reception and transmission and the ability to connect various sensors.*
Rationale	*The educational component contributes to the development of professional expertise in the most popular protocols for exchanging information between digital devices and a microcontroller. Study of digital sensors of physical quantities - temperature, humidity, light, gases, current, PIR-sensors, accelerometers, etc.*
Learning outcomes	*Expected learning outcomes include:* – *the ability to design microcontroller systems is one of the necessary skills of a modern electronics engineer.* – *an opportunity to learn how to create devices for security systems, information collection systems and the Internet of Things*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *design of microcontrollers systems, knowledge of the most popular protocols for exchanging information between digital devices and a microcontroller;* – *knowledge the design principles of modern microcontrollers systems for the Internet of Things.*
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Exam*

TECHNOLOGIES FOR CREATING EDUCATIONAL COMPUTER GAMES AND AUGMENTED REALITY DESIGN

Restrictions (specialty for which the course is offered)	171 Electronics
Educational level	*Second level /* Master's degree
Year of study	*1*
Number of ECTS credits	*4.5*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English*
Scope of the course	*The scope of the course includes 135 hours*
Rationale	*The educational component contributes to the development of professional expertise in in the field of applications' development with Extended Reality content - an environment that allows a person to perceive himself as included and interacting with some artificially created reality or its individual parts*
Learning outcomes	*Expected learning outcomes include:* *–study of theoretical aspects of computer game technologies and virtual and augmented reality;* *- study the functionality of frameworks for creating VR (Virtual Reality), MR (Mixed Reality), AR (Augmented Reality) applications;* *- the formation of skills and abilities to design hardware and software components for the formation of XR-content with varying degrees of immersion in cyberspace*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* - *design games and applications for virtual and augmented reality;* - *develop and debug effective algorithms for developing games and applications of virtual and augmented reality;* - *choose tools for developing and creating games and applications for virtual and augmented reality;* - *use different software development kits (SDK) for the implementation of information systems with immersive content, depending on the designated for future virtual and augmented reality functional applications;* - *be able to design and create user interfaces for visualization and management of virtual objects in immersive environments;*
Instructional Materials	*syllabus, learning materials -reference book, handbook, video lectures*
Mode of delivery	*Lectures, workshops /tutorials)*
End-of-semester control	*Test*

Software for Wireless Security Systems

Restrictions (specialty for which the course is offered)	*171 "Electronics"*
Educational level	*Second level /* Master's degree
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Department of Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2 (Completion of educational component " ")*
Scope of the course	*The scope of the course includes Study of professional tools for programming 8-bit and 32-bit microcontrollers. Programming of microcontrollers with built-in transceiver. Creating programs to work with various sensors and peripherals.*
Rationale	*The educational component contributes to the development of professional expertise in learning how to create software for wireless security systems as well as for the Internet of Things.*
Learning outcomes	*Expected learning outcomes include:* *learning programming environments, libraries in the C language of STM32, CC1310 microcontrollers for embedded systems with low power consumption*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* – *design of microcontrollers systems based on STM32, CC1310 microcontrollers;* – *demonstrate deep knowledge of professional tools for programming 8-bit and 32-bit microcontrollers.*
Instructional Materials	*syllabus, learning materials (textbook, reference book)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

Mathematical Modeling of Systems and Processes

Restrictions (specialty for which the course is offered)	*171 Electronics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Acoustic and Multimedia Electronic Systems*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The purpose of the discipline is to study the basic concepts of building mathematical models. Improving the skills of using software environments for computer and imitation research.*
Rationale	*Modern scientific and technical problems require quite complex numerical research. The design of modern devices requires preliminary multi-level research using complex numerical research.*
Learning outcomes	*The purpose of the discipline is the formation of students' competencies:* *GC1. Ability to abstract thinking, analysis and synthesis;* *GC5. Ability to search, process and analyze information from various sources;* *GC6. Ability to generate new ideas (creativity);* *SC3. Ability to systematically solve problems of development, analysis, calculation, modeling of electronic devices, components, devices and systems for various purposes;* *SC4. Ability to use information, computer and multimedia technologies, methods of modeling, intellectualization, artificial intelligence, experimental methods for research and analysis of processes in electronic devices, components, devices and systems;* *SC11. Ability to plan and conduct research using modern experimental methods and tools and methods of computer modeling, analyze research results, substantiate conclusions and recommendations.*
Competencies and skills	*Program learning outcomes provided in the educational program of the specialty 171 Electronics:* *R2. Model and experimentally study phenomena and processes in electronic devices, devices and systems, in technologies of the electronic industry.* *R3. Collaborate with the customer during the formulation of the terms of reference and discussion of technical solutions and results of projects, to lead a reasoned professional and scientific discussion.* *R7. Carry out information and scientific research using scientific, technical and reference literature, databases and knowledge, other sources of information, critically interpret and interpret existing knowledge and data, form areas of research and development based on domestic and foreign experience.* *R14. Investigate processes in electronic components, devices and systems using modern experimental methods and equipment, computer modeling methods, perform statistical processing and analysis of experimental results and calculations.*
Instructional Materials	*syllabus, learning materials (presentation)*
Mode of delivery	*Lectures, praticesc*
End-of-semester control	*Exam*

172 Telecommunications and Radio Engineering

Informatics - 2	
Restrictions (specialty for which the course is offered)	*172 Telecommunications and Radiotechnics*
Educational level	*First level (Bachelor's degree)*
Year of study	*1*
Number of ECTS credits	*7*
Language of study	*English*
Department	*Design of Electronic Digital Equipment*
Assumed knowledge and prerequisites	*English B1*
Scope of the course	*The scope of the course includes algorithms fundamentals, basics of C and C++ programming language*
Rationale	*The educational component contributes to the development of professional expertise in programming*
Learning outcomes	*Expected learning outcomes include:* *– implement search and sorting algorithms* *– build and traverse graphs and trees* *– write and debug code using C/C++ programming languages*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– implement and analyze fundamental algorithms* *– implement simple applications using C/C++ programming languages*
Instructional Materials	*syllabus, learning materials: video lectures*
Mode of delivery	*lectures, workshops*
End-of-semester control	*Exam*

Functional and Logical Design	
Restrictions (specialty for which the course is offered)	*172 Telecommunications and Radiotechnics*
Educational level	*First level (Bachelor's degree)*
Year of study	*2*
Number of ECTS credits	*5*
Language of study	*English*
Department	*Design of Electronic Digital Equipment*
Assumed knowledge and prerequisites	*English B1, completion of educational component "Informatics - 1"*
Scope of the course	*The scope of the course includes number systems and binary arithmetic, Boolean algebra, methods for definition and optimizing of binary functions, methods of finite state automata synthesis. Examples of design of basic digital devices using the acquired knowledge*
Rationale	*The educational component contributes to the development of professional expertise in digital devices design*
Learning outcomes	*Expected learning outcomes include:* – *Do synthesis of basic combinational logic devices (de- coders, multiplexers, adders, multipliers, dividers, shifters etc)* – *Do synthesis of basic sequential logic devices (flip-flops, registers, counters etc)*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– define and minimize Boolean functions* *– design basic digital devices*
Instructional Materials	*syllabus, video lectures*
Mode of delivery	*lectures, workshops*
End-of-semester control	*Exam*

Informatics - 1	
Restrictions (specialty for which the course is offered)	*172 Telecommunications and Radiotechnics*
Educational level	*first (Bachelor)*
Year of study	*1*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Design of Electronic Digital Equipment (DEDEC)*
Assumed knowledge and prerequisites	*English B1*
Scope of the course	*The subject of the discipline is the basics of programming in C, algorithmization.*
Rationale	*Knowledge in the field of programming is extremely relevant today and in the near future in the labor market. Even if you are not going to become a programmer, according to employers, programming skills are required, as business processes require digital approaches.*
Learning outcomes	*Create program applications of varying complexity using C language.*
Competencies and skills	*- be able to use all constructions of the C language, regardless of syntactic and semantic complexity;* *- master the skills of software product optimization;* *- use Arduino IDE for programming and testing;* *- master the skills of creating documentation for a software product;*
Instructional Materials	*Presentations, laboratory works, video lectures*
Mode of delivery	*lectures, workshops*
End-of-semester control	*Test*

Environmental Safety of Engineering Activity	
Restrictions (specialty for which the course is offered)	*172 Telecommunications and Radiotechnics*
Educational level	*first (Bachelor)*
Year of study	*2*
Number of ECTS credits	*2*
Language of study	*English*
Department	*Design of Electronic Digital Equipment (DEDEC)*
Assumed knowledge and prerequisites	*English B1*
Scope of the course	*Principles of business processes creating different products at the Internationals standard ISO 14001 (environmental management system)*
Rationale	*Knowledge in the field of international standardization is extremely relevant today, as companies are actively trying to enter world markets and to implement environmental management systems.*
Learning outcomes	*As a result of studying the discipline the student must know:* *- basics of product certification and standardization;* *- regulatory framework for product quality management and certification;* *- procedure for implementing standards;* *- the procedure for developing methods and standards of the enterprise;* *- International standards of ISO 9000, ISO 14000.*
Competencies and skills	*Students will be able to prepare various types of production for international certification, identify the processes necessary for the environmental management system, evaluate their effectiveness, control processes and products, and keep records.*
Instructional Materials	*Access to lectures and presentations on the discipline.*
Mode of delivery	*lectures, workshops*
End-of-semester control	*Test*

Fundamentals of Circuits Theory	
Restrictions (specialty for which the course is offered)	*172 Telecommunications and Radiotechnics*
Educational level	*first (Bachelor)*
Year of study	*2*
Number of ECTS credits	*8*
Language of study	*English*
Department	*Design of Electronic Digital Equipment (DEDEC)*
Assumed knowledge and prerequisites	*English B1*
Scope of the course	*The scope of the course includes basic methods of circuit analysis and design*
Rationale	*The educational component contributes to the development of professional expertise in methods of circuit analysis as a basis of modern systems of automated circuit design of radio electronic devices*
Learning outcomes	*Expected learning outcomes include: application of basic methods for calculating the characteristics of radio electronic circuits in main modes of operation*
Competencies and skills	*Upon successful completion of the course students are expected to be able to: apply the acquired knowledge and skills to bring circuit design solutions in correspondence with the requirements of the terms of reference for the creation of radio electronic devices*
Instructional Materials	*syllabus, learning materials: video lectures*
Mode of delivery	*lectures, seminars, workshops*
End-of-semester control	*Exam*

141 Electric Power Engineering, Electrotechnics and Electromechanics

MATHEMATICAL METHODS OF OPTIMIZATION IN POWER ENGINEERING	
Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Power Supply Department*
Assumed knowledge and prerequisites	*English B2. Completion of educational components "Mathematical Modeling and Decision Making in Power Supply Systems", "Relay Protection and Automation for Power Supply Control in Electric Power Distribution Systems"*
Scope of the course	*The scope of the course includes the following chapters:* *1. Introduction to optimization;* *2. Classical optimization techniques;* *3. Selected methods of linear programming;.* *4. Selected methods of nonlinear programming;* *5. Dynamic programming.*
Rationale	*The educational component contributes to the development of professional expertise in mathematical methods that are used to solve optimization problems in the field of electrical power systems.*
Learning outcomes	*Expected learning outcomes include:* *– knowledge about theories of large systems, system analysis and mathematical methods that are used to solve optimization problems in the field of electrical power systems;* *– knowledge about approaches to optimal planning and conducting experiments, methods of processing and evaluation of experimental research results using modern information technologies, current norms and requirements for the execution of reports;* *– acquire a skill to apply methods of optimization of modes of operation and to use computer technology for their implementation in managing the electrical distribution systems.*
Competencies and skills	*Upon successful completion of the course students are expected to develop general competencies: ability to abstract thinking, analysis and synthesis (1); ability to make informed decisions (2); and to achieve professional competencies: ability to demonstrate knowledge and understanding of mathematical principles and methods necessary for use in electrical energetics, electrical engineering and electromechanics (1); ability to investigate and define the problem and identify constraints, including those related to environmental protection, sustainable development, health and safety, and risk assessments in electrical energetics, electrical engineering and electromechanics (2); ability to make decisions on the optimal distribution of electrical energy to consumers at all levels of the electric power sector, taking into account energy efficiency and environmental factors, minimizing the level of electrical energy losses, ensuring the reliability and quality of electric power supply (3).*
Instructional Materials	*Syllabus, learning materials*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Exam*

MATHEMATICAL MODELING OF PROCESSES AND SYSTEMS IN POWER ENGINEERING	
Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Power Supply Department*
Assumed knowledge and prerequisites	*English B2. Completion of educational components "Mathematical Modeling and Decision Making in Power Supply Systems", "Relay Protection and Automation for Power Supply Control in Electric Power Distribution Systems"*
Scope of the course	*The scope of the course includes the following chapters:* *1. Introduction to mathematical modelling of processes and systems in power engineering;* *2. Mathematical optimisation methods;* *3. CAD systems for mathematical modelling;.* *4. Energy models of buildings;* *5. Dynamic models.*
Rationale	*The educational component contributes to the development of professional expertise in mathematical methods of modelling of processes and systems in power engineering.*
Learning outcomes	*Expected learning outcomes include:* *– knowledge about modern methods of system analysis, algorithms for calculating the parameters of elements and design of modern electric power distribution systems for using individual software products and CAD systems;* *– knowledge about fundamentals of design and operation of power electrical equipment of different classes of nominal voltages, rules of technical operation of electrical power facilities, standards of design activities in the field of electrical networks and electric power distribution systems;* *– knowledge about analytical methods for determining and numerical methods for calculating processes parameters in electrical power, electrotechnical and electromechanical equipment, its complexes and systems.*
Competencies and skills	*Upon successful completion of the course students are expected to develop general competencies: ability to abstract thinking, analysis and synthesis (1); ability to learn and to acquire modern knowledge (2); and to achieve professional competencies: ability to demonstrate knowledge and understanding of mathematical principles and methods necessary for use in electrical energetics, electrical engineering and electromechanics (1); ability to plan, organize and carry out scientific research in the field of Electric Power Engineering, Electrical Engineering and Electromechanics (2); ability to use software for computer modeling, automated design, automated production and automated manufacturing of elements of electrical power, electrical and electromechanical systems (3).*
Instructional Materials	*Syllabus, learning materials*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Exam*

THEORY OF NONLINEAR ELECTRIC AND MAGNETIC CIRCUITS	
Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Power Supply Department*
Assumed knowledge and prerequisites	*English B2. Completion of educational components "Mathematical Modeling and Decision Making in Power Supply Systems", "Theoretical Fundamentals of Electrical Engineering", "Mathematical Tasks of Power Engineering", "Mathematical Methods of Optimization in Power Engineering"*
Scope of the course	*The scope of the course includes the following chapters:* *– the main features nonlinear electric and magnetic circuits;* *– harmonics in power systems;* *– nonsinusoidal circuits, Fourier series;* *– circuit response to a nonsinusoidal input;* *– graphical analysis nonlinear electric circuits;* *– power factor in electrical power systems with non-linear loads;* *– power quality analysis & monitoring;* *– electromagnetism, inductances & transformers;* *– analysis magnetic circuits;* *– magnetic circuits transformers.*
Rationale	*The educational component contributes to the development of professional knowledge of methods of analysis and modelling of nonlinear and magnetic circuits.*
Learning outcomes	*Expected learning outcomes include:* *- knowledge of the theory of analysis of quality parameters of electricity parameters, in particular, the presence and influence of higher harmonics in power systems, the use of signal decomposition in the Fourier series, analysis and monitoring of electricity quality, the analysis of magnetic circuits.* *- knowledge of the features of nonlinear electric and magnetic circuits, modern methods of analysis of electromagnetic processes in processes in nonlinear and magnetic circuits;* *- knowledge of analytical methods of determination and numerical methods of calculation of process parameters in nonlinear and magnetic circuits, which are elements of equivalent schemes of replacement of power supply and distribution systems.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– apply the obtained theoretical knowledge, scientific and technical methods for solving scientific and technical problems and problems of Electric Power Engineering, Electrical Engineering and Electromechanics:* *– analyze technical and economic indicators and to carry out examination of design solutions in the field of Electric Power Engineering, Electrical Engineering and Electromechanics;* *– demonstrate knowledge and understanding of mathematical principles and methods necessary for use in Electric Power Engineering, Electrical Engineering and Electromechanics;* *– use software for computer modelling, automated design, automated production and automated manufacturing of elements of electrical power, electrical and electromechanical systems.*
Instructional Materials	*Syllabus, learning materials*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Exam*

HIGHER SCHOOL PEDAGOGY	
Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*2*
Language of study	*English*
Department	*Psychology and Pedagogic Department*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes the following topics: Introduction to Higher School Pedagogy; Principles and Methods of Teaching; Organizational Forms of Training in High School; Psychological and Didactic Foundations of the Learning Process; Methodical Support of the Educational Process; The Main Characteristics of the Training Quality Control System; The Pedagogical Activity of a Teacher in High School; New Pedagogical Technologies.*
Rationale	*The educational component contributes to the development of professional expertise in the development, and implementation of all types of classes and control measures in higher education institutions, analysis, and selection of effective didactic teaching methods, critical evaluation of classes. An integral competence of studying this discipline is the ability to perform the duties of a teacher of a higher education institution.*
Learning outcomes	*Expected learning outcomes include:* *– Skills to organize and manage the cognitive activity of students, to form in students critical thinking and the ability to carry out educational activities with all its components;* *– Ability to implement educational programs and curricula in accordance with state standards of higher education, as well as to develop and conduct all types of classes and tests in a higher educational institution.*
Competencies and skills	*Upon successful completion of the course, students are expected to be able to: – organize and analyze their pedagogical activities; – determine appropriate methods and means of training and control; – organize and manage the cognitive activity of students; – analyze educational and educational-methodical literature and to use it in pedagogical practice; – monitor and evaluate learning outcomes.*
Instructional Materials	*Syllabus, learning materials*
Mode of delivery	*Lectures, seminars (workshops)*
End-of-semester control	*Final test*

INTEGRATED RESOURCE PLANNING IN POWER ENGINEERING	
Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Power Supply Department*
Assumed knowledge and prerequisites	*English B2. Completion of educational components "Mathematical Modelling and Decision Making in Power Supply Systems"*
Scope of the course	*The scope of the course includes the following chapters:* *1. Introduction to integrated resource planning in power engineering;* *2. Electricity charging in the context of Integrated Resource Planning;* *3. Tariffs in power supply contracts;.* *4. System differentiation of electricity tariffs;* *5. Dynamic pricing.*
Rationale	*The educational component contributes to the development of professional expertise in mathematical methods of modelling of processes and systems in power engineering.*
Learning outcomes	*Expected learning outcomes include:* *– knowledge about the main clauses of normative and legislative documents that regulate innovation activity in Ukraine;* *– knowledge about current standards, regulatory acts and regulations, according to which activities in the field of Electrical Power Engineering, Electrical Engineering and Electromechanics are carried out in Ukraine;* *– knowledge about approaches to optimal planning and conducting experiments, methods of processing and evaluation of experimental research results using modern information technologies, current norms and requirements for the execution of reports of researches.*
Competencies and skills	*Upon successful completion of the course students are expected to develop general competencies: ability to abstract thinking, analysis and synthesis (1); ability to learn and to acquire modern knowledge (2); and to achieve professional competencies: ability to demonstrate knowledge and understanding of mathematical principles and methods necessary for use in electrical energetics, electrical engineering and electromechanics (1); ability to demonstrate awareness and ability to use regulatory acts, norms, rules and standards in Electric Power Engineering, Electrical Engineering and Electromechanics (2); ability to manage projects and evaluate their results (3).*
Instructional Materials	*Syllabus, learning materials*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Final test*

INTELLIGENT TECHNOLOGIES FOR ELECTRICITY DISTRIBUTION

Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Power Supply Department*
Assumed knowledge and prerequisites	*English B2. Completion of educational components "Mathematical Modelling and Decision Making in Power Supply Systems", "Electric Systems and Electrical Networks", "Relay Protection and Power System Automation", "Information Systems and Technologies in Electric Power Industry", "Alternative Energy Sources in Power Supply Systems"*
Scope of the course	*The scope of the course includes the following sections and topics:* *Section 1. Intellectualization and optimization of functioning of power systems, electric networks, power supply systems; research methods of intelligent energy systems and complexes.* *Topic 1. Tasks of intellectualization and optimization of modes of operation of power systems, electric networks, power supply systems according to the modern concept of Smart Grid.* *Topic 2. Modern research methods of intelligent energy systems and complexes, regulatory and legal support.* *Section 2. Effective functioning of intelligent energy systems and complexes; technological basis and control methods according to the Smart Grid concept.* *Topic 3. Methods of formation and ensuring the effective functioning of intelligent energy systems and complexes; elements of the technological basis for the implementation of the Smart Grid concept.* *Topic 4. Modern methodology for managing intelligent energy systems and complexes according to the requirements of the Smart Grid concept.*
Rationale	*The subject of the discipline is to: acquire skills of independent research and technical tasks for building intelligent power supply systems through the use of modern equipment for flexible control of electricity transmission technologies, implementation of the concept of distributed generation, the concept of autonomous power supply systems (Microgrid) renewable energy sources.*
Learning outcomes	*Expected learning outcomes include:* *- scientific bases of the modern concept of modernization of power supply systems according to the Smart Grid concept, creation of innovative equipment for flexible control of modes and increase of throughput of electric power systems and networks;* *- principles of operation, devices and main characteristics of innovative equipment for construction and flexible control of modes and increase of capacity of electric power systems and networks (formation of modern technological base according to the Smart Grid concept);* *- information and communication technologies for implementing the provisions of the Smart Grid concept;* *- hierarchy and content of tasks to improve the efficiency of power systems and power supply systems;* *- mathematical description of the main elements of innovative power systems and power supply systems, focused on solving problems of energy efficiency.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– perform original research, achieve scientific results that create new knowledge in electrical engineering and related interdisciplinary areas and can be published in leading scientific journals in electrical engineering and related fields;* *– present and discuss orally and in writing the results of scientific research and / or innovative developments in Ukrainian and English, deep understanding of English scientific texts in the field of research;* *– use modern information technologies, databases and other electronic resources, specialized software in scientific and educational activities;* *– identify, pose and solve research problems in the field of electrical engineering, evaluate and ensure the quality of research.* *Knowledge: advanced conceptual and methodological knowledge in electrical engineering and at the frontiers of subject areas, as well as research skills, sufficient for conducting scientific and applied research at the level of the latest world achievements in the relevant field, gaining new knowledge and / or implementing innovations.* *Skills: (1) plan and perform experimental and / or theoretical research in electrical engineering and related interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge on the research problem; (2) to deeply understand the general principles and methods of technical sciences, as well as the methodology of scientific research, to apply them in their own research in the field of electrical engineering and in teaching practice.*
Instructional Materials	*Syllabus, learning materials*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Final test*

INNOVATIONS IN ENERGY SECTOR	
Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*2*
Language of study	*English*
Department	*Power Supply Department*
Assumed knowledge and prerequisites	*English B2.*
Scope of the course	*The scope of the course includes the following topics: Introduction to energy innovations; technological innovations and their impact on energy demand, determinants of demand for primary energy resources, as well as the distribution of demand around the world, energy supply and market distribution. key technological and commercial attractiveness factors of fossil fuels innovations, key technological and commercial attractiveness factors of renewable energy sources, stakeholders and strategies in energy business innovations*
Rationale	*The educational component contributes to formation of understanding and ability to analyze impact factors that drive innovations in energy sector, the importance of local innovation clusters, local resources and practices of energy leaders in development of innovative energy infrastructure..*
Learning outcomes	*Expected learning outcomes include:* *– ability to access incremental and disruptive innovation potential* *– monitoring of energy startups and r'n'd* *– understand needs of local and global energy sector* *– impact of energy relative innovations on sustainable development goals*
Competencies and skills	*Upon successful completion of the course, students are expected to be able to: – organize and analyze innovation trends – apply methods and approaches for analysis based on the evaluation of available information – access microgrid and local grid energy project*
Instructional Materials	*Syllabus, learning materials*
Mode of delivery	*Lecture, seminars (workshops)*
End-of-semester control	*Final test*

PRACTICAL COURSE OF FOREIGN LANGUAGE FOR SCIENTIFIC COMMUNICATION	
Restrictions (specialty for which the course is offered)	*141 Electrical energetics, electrical engineering and electromechanics*
Educational level	*Second level (Master's degree)*
Year of study	*2*
Number of ECTS credits	*1.5*
Language of study	*English*
Department	*Department of English for Engineering No. 1*
Assumed knowledge and prerequisites	*English B2+/C1*
Scope of the course	*The scope of the course includes further scientific work of the graduate of master's degree and, accordingly, provides mastering of language knowledge and speech skills at the level necessary for effective communication in a foreign language academic environment. The syllabus of the discipline is built following the national doctrine of educational development in Ukraine, taking into account new advanced methods and technologies of teaching and integrating all stages of the educational process.*
Rationale	*The educational component contributes to the development of professional expertise in foreign language speech competencies for general academic purposes in listening, speaking, reading, writing and translation at an advanced level (B2 + / C1), improving knowledge of scientific terminology and skills to work with different genres of scientific literature, as well as acquiring linguistic and sociocultural -strategic and pragmatic competencies necessary for the successful implementation of communicative intentions during academic and scientific communication.*
Learning outcomes	*Expected learning outcomes include the ability to acquire knowledge, develop and improve communication skills and abilities in various academic environment, to effectively process the authentic scientific sources, develop and improve skills and abilities required for other academic and professionally-oriented communication.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- understand the main ideas and recognize relevant information during discussions, debates, reports, conversations, lectures;* *- make individual presentations on a wide range of academic and professional topics; understand authentic texts from scientific-academic, popular science, specialized journals and Internet sources;* *- determine the content and relevance of new sources, articles and reports and analyze information on a wide range of educational and professional topics for further use; write essays based on the authentic scientific literature on the speciality, reports on professional topics, articles, abstracts, abstracts, academic essays; prepare and produce academic and professional correspondence (letters, e-mails, reports, technical documentation, etc.).*
Instructional Materials	*syllabus, learning materials (textbook, reference book, video lectures, podcasts)*
Mode of delivery	*seminars/workshops*
End-of-semester control	*Test*

184 Mining

Intellectual Property and Patenting	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (1 semester)*
Number of ECTS credits	*2 (60 hours)*
Language of study	*English*
Department	
Assumed knowledge and prerequisites	*English B2.*
Scope of the course	*The scope of the course includes lections and control tasks*
Rationale	*Formation of students of heredical specialties professional knowledge of the general provisions of the law intellectual property, its institutions, concepts and types, objects and subjects, grounds for occurrence, conditions and procedure of the use of its results, order and methods of protection violated rights*
Learning outcomes	*Manage processes and project environments duringorganization of innovation activities, decision-making andorganization of actions on the process of assessment, acquisition of rights andintroduction of intellectual property in economic circulation*
Competencies and skills	*Application of management technologies duringcreation, protection, use and protection of objectsintellectual property. Control progressplanned deadlines and compliance with theestablished rules and requirements of regulatory documents in the field of intellectual property.*
Instructional Materials	*syllabus, learning materials (reference book, regulatory documents etc)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

Practical course of Foreign Language on Business Communication	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*3 (90 hours)*
Language of study	*English, Ukraine*
Department	
Assumed knowledge and prerequisites	*English B2.*
Scope of the course	*The scope of the course includes lections and control tasks*
Rationale	*The educational component contributes to the development of professional expertise in branch of reconstruction of underground construction*
Learning outcomes	*After the course, you will write articles on a narrow specialty*
Competencies and skills	*Ability to communicate fluently on special topics*
Instructional Materials	*syllabus, learning materials (reference book, regulatory documents etc)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

Management of startup projects	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*3 (90 hours)*
Language of study	*English, Ukraine*
Department	
Assumed knowledge and prerequisites	*English B2.*
Scope of the course	*The scope of the course includes lections and control tasks the the formation of a system of theoretical knowledge and applied skills and abilities to create and manage startup projects.*
Rationale	*The educational component contributes to the development of professional expertise in branch of reconstruction of underground construction*
Learning outcomes	*Ability to implement ideas*
Competencies and skills	*The ability to find ideas that can come from anywhere - from the work you do, from your reading, your knowledge area or experience in attracting*
Instructional Materials	*syllabus, learning materials (reference book, regulatory documents etc)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Test*

Geotechnical Structures Construction	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (1 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of the basics of construction, building materials and structures, underground and aboveground structures.*
Scope of the course	*The scope of the course includes:* *- Types and classifications of buildings and structures of mining enterprises;* *- spatial planning solutions of the mine surface;* *- principles of construction of the general plan of a surface of the mining enterprises;* *- technological complexes and constructive decisions of the main and auxiliary trunks;* *- constructive decisions of dill;* *- complexes of concentrators;* *- construction of energy facilities;* *- construction of transport facilities;* *- construction and operation of bunkers and silos;* *- design and construction of the surface complex of subways.*
Rationale	*Mining companies have a complex complex of surface buildings and structures, which in some cases reaches up to 40% of the total cost of the enterprise. A significant part of production processes is provided by buildings and structures of the surface complex. Reducing the cost of construction of surface complex depends on the use of modern methods of design and construction of mining facilities, which is the subject of the discipline.*
Learning outcomes	*Expected learning outcomes include:* *- plan the development of the surface complex of mining and underground transport enterprises;* *- design the parameters of the general plan of the surface;* *- to carry out generalization and analysis of volume-planning decisions of surface constructions of the underground;* *- to make a comparative assessment of construction technologies and technical and economic indicators of construction;* *- to manage the construction of mining facilities.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- assess the technological and transport basis of the master plan of the surface of mining enterprises;* *- to characterize constructive types and functions of technological complexes of the main and auxiliary trunks;* *- to substantiate effective constructive decisions and technologies of installation of buildings and constructions of a surface complex;* *- substantiate the methods of construction and operation of energy and transport facilities;* *- substantiate the effective design parameters of the surface complex of subways;* *- choose material and energy-saving construction technologies;* *- assess the economic parameters of the construction of surface facilities of mining enterprises.*
Instructional Materials	*syllabus, learning materials (reference book, regulatory documents etc)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Exam*

Underground Enterprises Reconstruction	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (1 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline the student must be acquainted with the underground construction, technology of the build.*
Scope of the course	*The scope of the course includes lections and control tasks*
Rationale	*The educational component contributes to the development of professional expertise in branch of reconstruction of underground construction*
Learning outcomes	*Expected learning outcomes include:* *– Causes and consequences of emergency construction* *– Methods and means of accident elimination*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– Regulatory requirements for the operation of buildings* *– to develop a reconstruction project*
Instructional Materials	*syllabus, learning materials (reference book, regulatory documents etc)*
Mode of delivery	*lectures (seminars/workshops)*
End-of-semester control	*Exam*

Specialized Course On Underground Construction	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline the student must be acquainted with the special technology of the build, underground construction.*
Scope of the course	*The scope of the course includes lections and control tasks*
Rationale	*The educational component contributes to the development of professional expertise in branch of special methods of underground construction*
Learning outcomes	*Expected learning outcomes include:* *– scope of the special methods of construction* *– technology of works for Special methods of construction*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *– Regulatory requirements for the special methods of construction* *– to develop a projecting for the special methods of construction*
Instructional Materials	*syllabus, learning materials (reference book, regulatory documents etc)*
Mode of delivery	*lectures (seminars/workshops /tutorials)*
End-of-semester control	*Exam*

Computer-Aided Design System	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (1 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Completion of educational component: Geomechanical processes in rock massifs, Mathematical modeling of geomechanical processes*
Scope of the course	*In accordance with the purpose of training masters requires the formation of the following abilities:* *- The use of Ansys Fluent shows its suitability for modeling combustion and gasification of coal fuel in unconventional coal processing methods.* *- Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)*
Rationale	*The subject study of the discipline are methods of predicting the behavior of soils in the construction of geotechnical objects in these soils.*
Learning outcomes	*The use Ansys Fluent for predicting and designing dynamic problems*
Competencies and skills	*Program competencies: ability to identify, pose and solve research problems in the field of mining, evaluate and ensure the quality of research, formation of additional competencies about modern tools and technologies of search, processing and analysis of information, information systems of geomonitoring.*
Instructional Materials	*syllabus, learning materials*
Mode of delivery	*lectures (seminars/workshops /tutorials)*
End-of-semester control	*Test*

Special Methods of Building	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. It is based on the study of disciplines "Materials science and basics of construction", "Materials and constructions of mine structures", "Technology of construction of mine workings", "Construction of urban underground structures" and "Technology, mechanization and organization of underground construction".*
Scope of the course	*The scope of the course includes is the formation of students ability to professionally possess prostheses and practical skills in the construction of underground structures using special methods, to have basic knowledge of fundamental sciences to the extent necessary for the development of general professional disciplines, to choose methods and methods of fixing the soil during the passage of underground excavations.*
Rationale	*The main purpose of the discipline is to form professional competencies necessary for independent research work, the result of which is the writing and defines of a master's thesis, and research work in the research team*
Learning outcomes	*Use basic knowledge of fundamental sciences to the extent necessary for the development of general professional disciplines; choose constructive schemes "wall in the soil" depending on the geological conditions and the purpose of the structures; to substantiate special methods of construction in the construction of underground structures; choose the method of fixing the soil array during mining; apply the acquired theoretical knowledge in the substantiation and design of underground structures and objects of special purpose in conditions of dense urban development and in difficult mining and geological conditions.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to the methods of construction of urban underground structures in special ways, which are used in difficult geological conditions, in conditions of dense urban development and in the construction of special purpose objects; skills of a designer engineer in the field of underground construction.*
Instructional Materials	*syllabus, learning materials*
Mode of delivery	*lectures (seminars/workshops /tutorials)*
End-of-semester control	*Exam*

Municipal Underground Structures Engineering	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (1 semester)*
Number of ECTS credits	*3.5 (105 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. It is based on the study of disciplines " Applied Mechanics (TMM + Resistance of Materials)", "Materials Science and Fundamentals of Construction", "Foundations and Foundations", "Materials and Structures of Mine Structures". Requires students of basic training in natural and technical sciences of geoengineering disciplines and is the basis for the final cycle of dissertation preparation.*
Scope of the course	*During the teaching of theoretical material, a research method is used aimed at studying the literature, sources, conducting observations, performing search actions.* *And also practical classes, consultations, independent preparation in library and on the basis of the Internet - resources, independent individual work are provided.*
Rationale	*A specialist with modern methods of mathematical modeling of geomechanical processes, able to adequately choose a mathematical model, choose the optimal type of foundation, properly carry out work on its construction, anticipate possible consequences arising from the operation of structures and effectively influence their development.*
Learning outcomes	*Expected learning outcomes include:* *- Ability to abstract thinking, analysis, synthesis and evaluation of modern scientific achievements, generating new knowledge in solving research and practical problems;* *- Ability to identify, pose and solve research problems in the field of mining, evaluate and ensure the quality of research.* *- Ability to apply modern information technologies for geomonitoring and research of array properties.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- Plan and perform experimental and / or theoretical research in mining and related interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge about the research problem.* *- Develop and research conceptual, mathematical and computer models of processes and systems, effectively use them to gain new knowledge and / or create innovative products in geoengineering.* *- Apply modern tools and technologies for searching, processing and analyzing information, information systems for geomonitoring and research of array properties.*
Instructional Materials	*syllabus, learning materials*
Mode of delivery	*lectures (seminars/workshops /tutorials)*
End-of-semester control	*Exam*

Course project in Municipal Underground Structures Engineering	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (1 semester)*
Number of ECTS credits	*1.5 (45 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. It is based on the study of disciplines " Municipal Underground Structures Engineering ".*
Scope of the course	*The course project must be prepared for defense within the period set by the teacher. An explanatory note and a drawing are submitted to defend the course project.* *The explanatory note includes the following components: title page, assignments for the course project, table of contents, including the names of all sections and paragraphs with page numbers, introduction, which indicates the purpose and objectives of the course project; the theoretical part, which describes the theoretical information on the topic of the project; and drawings to the project. At the end of the explanatory note the conclusion on results of work is presented*
Rationale	*Course design also aims to teach students to quickly and confidently use the relevant reference books, state standards, tables, standard projects and other materials that the specialist uses in his professional activity, to instill in students the skills of calculations, feasibility studies, explanatory notes etc.*
Learning outcomes	*Expected learning outcomes include:* - *Apply the acquired knowledge and skills of calculations of building structures of underground structures, taking into account the load and impacts, purpose and their characteristics*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* - *use basic knowledge about the purpose and characteristics of underground structures to choose the organization, method and technology of construction of underground structures;* - *perform calculations of elements of building structures in accordance with the norms (according to the boundary conditions of the first and second groups);* - *use software to display the results of calculations in graphical form.*
Instructional Materials	*syllabus, learning materials*
Mode of delivery	*lectures (seminars/workshops /tutorials)*
End-of-semester control	*Test*

Scientific Work on the Topic of Master's Thesis	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (1, 2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2.*
Scope of the course	*In accordance with the purpose of training masters requires the formation of the following abilities:* *- formation of abilities to create new knowledge, the ratio of this knowledge with existing domestic and foreign research, the use of knowledge in conducting expert work, for the practical use of methods and theories;* *- formation of abilities of self-improvement, expansion of limits of own scientific and professional knowledge, use of methods and means of knowledge, various forms and methods of training and self-control, new educational technologies, for own intellectual development and increase of cultural level;* *- development of abilities for cooperation within the framework of interdisciplinary projects, work in related fields.*
Rationale	*The main purpose of the discipline is to form professional competencies necessary for independent research work, the result of which is the writing and defense of a master's thesis, and research work in the research team*
Learning outcomes	*The subject of the discipline - teaching students to work independently with literary sources, with a variety of devices, plan their work, analyze and summarize the results of research and present them in the form of a master's thesis.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- Ability to abstract thinking, analysis, synthesis and evaluation of modern scientific achievements, generating new knowledge in solving research and practical problems;* *- Ability to identify, pose and solve research problems in the field of mining, evaluate and ensure the quality of research.* *- Ability to apply modern information technologies for geomonitoring and research of array properties.* *- Plan and perform experimental and / or theoretical research in mining and related interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge about the research problem.* *- Develop and research conceptual, mathematical and computer models of processes and systems, effectively use them to gain new knowledge and / or create innovative products in geoengineering.* *- Apply modern tools and technologies for searching, processing and analyzing information, information systems for geomonitoring and research of array properties.*
Instructional Materials	*syllabus, learning materials* *https://classroom.google.com/c/MjUyNjU2ODI4OTM3?cjc=3tdbc2y*
Mode of delivery	*lectures (seminars/workshops /tutorials)*
End-of-semester control	*Test*

Designing of Underground Transport Systems	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of tunneling technologies, regulatory requirements for subway structures, geotechnical principles of mountain behavior, geological processes around underground structures.*
Scope of the course	*Methods for forecasting the development of urban transport flows. Substantiation of options for laying subway lines in urban conditions (radial, radial, ring, etc.). Step-by-step method of designing the launch complex of the subway section. Drawing up a project for the construction of underground structures of the subway: distillery tunnel, shallow station, train depot, ventilation structures, utilities.*
Rationale	*The modern development of megacities is ensured by the simultaneous construction of underground infrastructure, which should be included in a complex citywide network of utilities.The construction of subways in urban conditions is accompanied by a large-scale impact on surface and underground structures, which requires their renovation for further development, relocation for modernization. The discipline is aimed at solving a set of complex problems of development of urban transport systems related to the underground infrastructure of cities.*
Learning outcomes	*Expected learning outcomes include:* *- to make a forecast of the development of transport networks of the metropolis,* *- to determine the possibilities of using underground structures to solve them* *- use a systematic approach to underground infrastructure planning.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *- Plan the development of underground infrastructure of large cities.* *- Design complexes of underground structures of metro networks.* *- Ensure sanitary requirements* *- Use the acquired knowledge and skills (competencies) pact of the subway on surface and underground structures.*
Instructional Materials	*Textbooks, tutorials, Google Classroom courses*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Exam*

Management of Technological Processes of Opencast Mining	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. By the beginning of the study of the discipline "Management of technological processes of opencast mining", the student should be familiar with the basics of mining in the development of deposits in an open way, the conditions of occurrence of minerals, methods of opening and preparing deposits for development, technologies for conducting mine workings, have a general idea of technological processes open pit mining.*
Scope of the course	*The scope of the course includes :* *- Fundamentals of scientific and technical management of the activities of an enterprise for the extraction of minerals;* *- Organization of production during open pit mining;* *- Management of individual technological processes for the development of mineral deposits;* *- Operational business planning at mining enterprises.*
Rationale	*The educational component contributes to the development of professional expertise in mastering the optimization methods of management of technological processes in subsoil use in order to achieve the most effective technical and economic indicators of mining.*
Learning outcomes	*Expected learning outcomes include:* *- Organize the activities of mining enterprises and technical management of systems and technologies of open pit mining;* *- Control individual technological processes in space and time;* *- Develop and implement start-up projects at an open pit mining enterprise;* *- Justify the feasibility and efficiency of making engineering decisions in production.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- to use the acquired knowledge for the organization of management of mining production and individual technological processes of open pit mining;* *- use modern resource-saving technologies for mining;* *- to implement mathematical methods of optimization in the management of technological processes in mining;* *- to apply modern information technologies and geoinformation systems for the planning of mining operations.*
Instructional Materials	*Textbooks, tutorials, video lectures, Moodle courses*
Mode of delivery	*Lectures, seminars*
End-of-semester control	*Exam*

Environmental Safety of Subsoil Use	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline the student must be acquainted with the general knowledge in the field of ecology, the basics of mining, basic knowledge of general chemistry.*
Scope of the course	*Fundamentals of a systematic approach to the issues of ecological safety of subsoil use at all levels and determination of conditions and clarification of regularities of formation of ecological danger in the specified sphere; issues of environmental safety in the implementation of special subsoil use in Ukraine; international experience in the field of ecologically safe subsoil use, eco-technologies in the mining industry; features of practical application of principles of ecological management in subsoil use*
Rationale	*The study of the discipline will allow students to navigate in modern methods and approaches to environmentally safe subsoil use to make informed and socially responsible decisions in professional activities.*
Learning outcomes	*Expected learning outcomes include:* *- to determine the main properties of natural and anthropogenically altered ecosystems in terms of the formation of ecological danger;* *- to analyze the emergence of environmentally hazardous situations in the field of subsoil use;* *- to identify the most tyhical components of environmental danger for a particular region, to determine its levels;* *- to determine the structure and functional tasks of environmental safety management bodies;* *- to develop specific measures for environmental safety management in the field of subsoil use;* *- apply software products and modern techniques to analyze the state of environmental safety*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *- assess the risks to the environment and human health from activities in the field of subsoil use;* *- substantiate management decisions based on the use of the necessary analytical and methodological tools;* *- use the acquired knowledge to ensure environmental safety, principles of organization and basic laws of environmental safety management.*
Instructional Materials	*Textbooks, tutorials, video lectures, Google Classroom courses*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Exam*

Designing of Connection between Ground and Underground Facilities	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of the basics of construction and construction of urban underground structures and ground facilities, technology of construction of mine workings, mechanization and organization of underground construction.*
Scope of the course	*Research of possibilities and directions of use of underground space of megacities in the system of regional development of land relations*
Rationale	*The problem of using the underground space of cities is most relevant in their central, most visited areas, where capital support and historically valuable buildings predominate, as well as in various specialized centers and in public transport complexes. In this case, underground structures can be located almost everywhere, including under buildings, streets and squares, as well as under water.* *Many objects of engineering-transport, social and industrial infrastructure are located safely and interconnected underground, integration of underground and above-ground constructions is provided. All this allows to use the territorial resource efficiently, to significantly save the area of scarce urban lands, to promote the protection of especially valuable lands and objects, to reduce gas pollution and noise in the territories.*
Learning outcomes	*Apply the acquired theoretical knowledge during the substantiation and design of underground structures and their connection with the objects of ground infrastructure in the conditions of dense urban development and in difficult mining and geological conditions*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *- to choose planning schemes of interconnected objects of engineering-transport social and industrial infrastructure, integration of underground and above-ground constructions;* *- to determine the efficiency of the use of underground space;- Develop measures to select the technological parameters of the excavator face and the mode of operation of the excavator*
Instructional Materials	*Textbooks, tutorials, video lectures, Google Classroom courses*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Exam*

Logistics of Mining Transport Systems	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Completion of educational component "Physics", "Geomechanics", "Theoretical Mechanics", "Fundamentals of Mining", "Technological Processes of Mining", "Mechanics of Continuous Media" and others.*
Scope of the course	*- Technological processes for increasing the efficiency of the movement of goods, resource saving and energy saving, logistics of mining and transport systems, the latest highly efficient equipment based on the advanced foreign achievements of the leading mining countries of the world. Prospects and development of the latest industrial transport systems.* *- prevention of the negative impact of mining and transport systems on the environment and human health.*
Rationale	*Mastering knowledge about modern mountain transport systems, the latest types and vehicles, their efficiency and intensification, taking into account the modern development of the mining industry, which require immediate rational and safe technical, economic and environmental use.*
Learning outcomes	*On the basis of the knowledge gained during the training, choose reasonable ways and solutions to ensure high efficiency of modern mining and transport systems, taking into account the environmental safety of their impact on the environment.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *- to analyze the technological process of mining and transport systems, to determine the level of their influence on the main technical, economic and environmental indicators of the enterprise;* *- to determine the main indicators of the transport system, qualitative and quantitative assessments of the impact on the efficiency of the movement of goods;* *- to offer promising methods and solutions for the operation of specific transport systems and vehicles.*
Instructional Materials	*Textbooks, tutorials, Google Classroom,*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Utilization and Processing of Mining Wastes	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of waste management and handling, assessment of their impact on the environment, regulation of anthropogenic load on the environment, modeling and forecasting of the state, continuum mechanics, geomechanics*
Scope of the course	*To obtain basic knowledge, skills and confidence in solving the urgent problem of our time - the completeness of preservation of the subsoil and the completeness of mining, utilization and handling of waste from the mining industry, calculations of the main parameters of processing and disposal of waste. technologies with the aim of preserving the environment and human health, the use in the future of additional knowledge gained on their main production activities.*
Rationale	*The purpose of studying the discipline "Utilization and processing of mining waste" is to develop students' engineering knowledge on the introduction of waste-free and low-waste technologies; processing, use and disposal of waste from the mining industry, taking into account responsibility for the condition and protection of the environment.*
Learning outcomes	*To obtain basic knowledge, skills and confidence in solving the urgent problem of our time - the completeness of preservation of the subsoil and the completeness of mining, utilization and handling of waste from the mining industry, calculations of the main parameters of processing and disposal of waste. technologies with the aim of preserving the environment and human health, the use in the future of additional knowledge gained on their main production activities.*
Competencies and skills	*The combination and use of knowledge on management and waste management within the framework of their main profession, the development of a new high-quality state of ecological thinking among students, to ensure ecological safety and environmental protection.*
Instructional Materials	*Textbook: "Solid waste landfills" http://ela.kpi.ua/handle/123456789/2618) tutorials, Google Classroom,*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Modernization of Underground Networks	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of the basics of underground construction, geological concepts and processes, underground structures.*
Scope of the course	*Urban underground infrastructure, engineering networks. A systematic approach to planning the development of underground networks. Ways to ensure the stability and reliability of geotechnical structures. Repair and modernization of networks using trenchless technologies. Monitoring the condition of underground engineering structures.*
Rationale	*Modern cities, especially megacities, have a complex and vulnerable network of underground utilities, which needs further development, renovation and repair. The discipline is aimed at solving complex problems of urban urban development: territorial, transport, water supply, energy, environmental, etc., related to the underground infrastructure of cities.*
Learning outcomes	*Analyze the problems of the urban environment and the possibility of using underground geotechnical structures to solve them;* *Assess the development and condition of underground networks;* *Use a systematic approach to underground infrastructure planning;* *Monitor the condition of underground engineering structures;* *Apply methods of modernization of underground networks (in particular - trenchless technologies).*
Competencies and skills	*Plan the development of underground infrastructure of large cities;* *Design the parameters of underground networks;* *To form monitoring systems for the condition of underground engineering structures;* *Choose effective ways to modernize underground networks;* *Ensure the replacement of the most dangerous ground transport and engineering communications - underground.*
Instructional Materials	*Textbook, Google Classroom,*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Resource-Saving Technologies for Mining and Processing of Rocks	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline "Resource-saving technologies of mining and processing of rocks" the student must be acquainted with the basics of mining in an open way, mining and geological conditions of development of mineral deposits, have a general idea of technology and mechanization of opencast mining.*
Scope of the course	*The scope of the course includes:* *- Existing technologies of extraction and processing of rocks* *- Modern requirements for the completeness and quality of mining* *- Ukrainian and international experience in the development and implementation of resource-saving subsoil use technologies* *- Criteria for resource conservation, their provision in mining*
Rationale	*Global mining trends are aimed at maximizing the use and extraction of mineral reserves and further maximum possible restoration of the disturbed natural landscape of the area where mining was carried out. Therefore, knowledge and development of resource-saving technologies for mining and processing of rocks is necessary for mining professionals.*
Learning outcomes	*Expected learning outcomes include:* *-To evaluate existing open pit mining technologies in terms of energy efficiency and resource conservation* *- To define criteria for resource conservation* *- To develop and implement energy and resource-saving technologies at the mining enterprise for mining and processing of minerals in an open way* *- To establish measures to increase the completeness of extraction of minerals, maximum use of waste processing and reclamation of the earth's surface*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *- use the acquired knowledge to develop resource-saving technologies for mining and processing of minerals* *- determine the indicators of efficiency of enterprises according to the criterion of resource saving* *- carry out optimization of technological processes of mining and processing of rocks in an open way according to the criteria of energy efficiency and resource conservation.*
Instructional Materials	*Textbooks, tutorials, Google Classroom courses*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Environmental Protection Technologies for Opencast Mining	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Completion of educational component "General ecology", "Atmospheric protection technology", "Hydrosphere protection technology", "Safety of work in mining".*
Scope of the course	*The scope of the course includes technologies of rock destruction, and their impact on the environment. The impact of technological processes and characteristics of blasting on the environment. Ways to reduce the negative impact of drilling and blasting on the environment. Features of operation of quarry transport. Ways to reduce the negative impact on the environment of rock movement processes. Ways to reduce the negative impact on the environment of mining waste storage processes*
Rationale	*Carrying out open development of mineral deposits, it is necessary to take into account the protection and preservation of the environment, the rational use of technological equipment for certain technological processes. It is necessary to know which machines and mechanisms that meet the requirements of current environmental legislation should be used, as well as other necessary environmental protection measures.*
Learning outcomes	*Expected learning outcomes include be able to substantiate environmental technologies based on an understanding of the mechanisms of human impact on the environment and the processes occurring in it. Implement scientifically sound technical, technological and organizational measures to prevent environmental pollution. To choose technologies of environmental protection, to search for the newest technical-technological and organizational decisions directed on introduction in manufacture of perspective ecological developments and the modern equipment. Analyze the areas of improvement of existing natural protection and nature restoration technologies to ensure environmental safety during opencast mining.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- To analyze the parameters of drilling and blasting operations and the environmental consequences of their action.* *- Analyze the impact of quarry transport on the environment.* *- Be able to set career options with minimal impact on the environment.* *- Determine the parameters of nature and resource-saving system of field development.*
Instructional Materials	*syllabus, learning materials (textbook, Google Classroom)*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Designing Underground Structures of Special Purpose	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of technologies "wall in soil", "lowering well", "supporting core", "supported vault" of trench tunneling, regulatory requirements for structures, geotechnical bases of behavior of the massif, geological processes around underground structures.*
Scope of the course	*The scope of the course includes design of large underground facilities for specific operating conditions depending on the purpose. Substantiation of options for construction of special purpose objects in the conditions of urban development. Design of underground fire tanks, underground warehouses, hazardous industries, civil defense depots. Drawing up of the project of construction of underground designs taking into account influence of the operating factors: water pressure, corrosion of harmful substances, action of an explosive wave, etc.*
Rationale	*The modern development of megacities is ensured by the simultaneous construction of underground infrastructure, which should be included in a complex citywide network of utilities. Construction in urban conditions is accompanied by a large-scale impact on surface and underground structures. The discipline is aimed at solving a set of complex problems of urban systems development related to the underground infrastructure of cities.*
Learning outcomes	*Plan the development of underground infrastructure of large cities. Design complexes of underground structures. To provide sanitary requirements of activity of the personnel of surface and underground constructions.*
Competencies and skills	*To make the forecast of development of influence of a massif on a construction, to define possibilities of use of underground constructions. Use a systematic approach to underground infrastructure planning.*
Instructional Materials	*syllabus, learning materials (textbook, Google Classroom)*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Mathematical Methods for Optimizing the Processes of Geoengineering Systems	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline "Mathematical methods for optimizing the processes of geoengineering systems" the student must be acquainted with the basics of mining, processes of opencast mining, methods for optimizing processes and systems*
Scope of the course	*- Extreme variational principles in modeling the processes of engineering ecosystems* *- Optimization criteria for complex ecosystems* *- Restrictions on state change and change of management in optimization models of processes of engineering ecosystems* *- Multidimensional unconditional gradient optimization*
Rationale	*The basis of resource-saving technologies in the quarry should be the optimization of process parameters in real time. Therefore, mining specialists need knowledge of both analytical and numerical special methods of mathematical analysis. The choice of the principle, method and criterion of optimization requires in-depth training of masters in mining.*
Learning outcomes	*According to the results of studying the discipline "Mathematical methods of optimization of processes of geoengineering systems" students will be able to:* *- use modeling and optimization methods to research and increase the efficiency of technological processes in the career;* *- establish a system of restrictions and conditions necessary for the development of a model of technological processes;* *- get the ability to own a package of programs for optimization of technological processes.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- Perform analysis of technological processes in the quarry to select the method of optimization of operational parameters* *- Apply modern approaches and methods of modeling and optimization of technological processes* *- Choose optimization criteria for a specific set of technological processes* *- Develop measures to increase the efficiency of the technological process in accordance with the results of optimization modeling*
Instructional Materials	*syllabus, learning materials (textbook, Google Classroom)*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Optimization of Quarrying Processes in the Quarry	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline " Optimization of mining operations in the opencast mine " the student must be acquainted with geomechanics, the current state of mining, taking into account the properties of rocks, organizational, technical and technological conditions at the enterprise for mining, as well as the state of energy costs when excavating rock mass in the opencast mine.*
Scope of the course	*The optimization of mining processes in the quarry is aimed at studying the patterns and dependences of the digging process with an excavator type power shovel using models and taking into account the dynamics of resistance of soil.*
Rationale	*Students develop engineering knowledge about the processes of mining in the quarry, energy costs during rock excavation, the impact of lump rock on energy consumption during excavation. Calculation of productivity of digging process and excavation works in general for excavators of power shovel type.*
Learning outcomes	*Expected learning outcomes include:* *- To use the received knowledge on optimization of processes of extraction of minerals in a quarry for increase of technical and economic and ecological efficiency of work of the mining enterprise* *- Ensure energy savings when operating the excavator in optimal mode*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- Develop measures to select the technological parameters of the excavator face and the mode of operation of the excavator* *- Calculation of variable operational productivity of excavators like power shovel and establishment of rational modes of their work* *- Optimization of excavator productivity in the quarry according to the criterion of energy intensity*
Instructional Materials	*syllabus, learning materials (textbook, Google Classroom)*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Resource Management of a Geotechnical Enterprise

Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of understanding the essence of the enterprise, general knowledge of economics and organization of production*
Scope of the course	*The scope of the course includes:* *- place, role and novelty of the resource concept of geotechnical enterprises in the theory of strategic management.* *- characteristics of the resources of geotechnical enterprises according to the following classification features: participation in the production process; by economic content; by role in the enterprise; on the possibility of display; according to the specifics of value formation; by existence in time; on the possibility of reproduction; by sources of formation, by the nature of organization and regulation;* *- description of resources as an object of management, disclosure of the logic of the ratio of resources and factors of production;* *- resource exchange as an object of economic management, characteristics of the state of national resource exchange;* *- management of technical resources of a geotechnical enterprise, methodical approaches to the assessment and management of technical resources as a basis for improving the efficiency of industrial enterprises;* *- management of material resources of the geotechnical enterprise, methodical and analytical support of processes of management of material resources;* *- management of labor resources of the geotechnical enterprise, system of indicators of an estimation of labor resources of the enterprise, management of motivation of work at the enterprise, the organization of work of personnel service of the enterprise;* *- management of organizational resources of the geotechnical enterprise, indicators of a condition and development of organizational system and its elements, an estimation of economic efficiency of measures for realization of organizational reserves;* *- features of information resources management, efficiency of information resources management in the value management system of the enterprise;* *- resource saving management, basics of resource saving strategy, system of indicators of resource intensity of goods and production;* *- management of financial resources of a geotechnical enterprise, the cost and structure of financial capital, methodological aspects of assessing the value of financial capital, determining the optimal structure of financial capital. indicators for assessing the effectiveness of the formation and use of financial capital;* *- investment management of a geotechnical enterprise, subjects and objects of investment activity, investment profit and its formation, essence and functions of investment management of the enterprise, investment policy of the enterprise, investment attractiveness of the enterprise, investment strategy and its formation, management of real investments, financial investment management , foreign investment management.*
Rationale	*Market conditions for the operation of geotechnical enterprises require the achievement of the most efficient use of enterprise resources, ensuring the stable development of economic activity, timely identification and resolution of problems arising in the process of enterprise management. Successful management of production and economic, production, sales and financial activities of the enterprise should be based on the use of structured and reliable data on resource provision and management of the enterprise, its change and forecast dynamics of development. The discipline of resource management of a geotechnical enterprise is aimed at solving these tasks.*
Learning outcomes	*Expected learning outcomes include:* *- to analyze the indicators of resource provision of the geotechnical enterprise;* *- to evaluate the effectiveness of resource management in retrospective and future aspects of the enterprise and organization;* *- development and implementation of management decisions that are related to the resource provision of strategic development of the enterprise in conditions of uncertainty;* *- to evaluate the resource flows of the enterprise by different methods;* *- to ensure balance and synchronicity of positive and negative cash flows of the enterprise in terms of individual intervals;* *- to determine the amount of operating, insurance, investment and cash balances and make decisions on the directions of their use;* *- to determine the economic effect of the introduction of innovations, intellectual investment.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to* *knowledge:* *- methodologies for assessing and analyzing the resources of the geotechnical enterprise;* *- composition and structure of resources;* *- application of modern tools for management and optimization of use, generation of ideas for designing the processes of resource supply and resource conservation in the enterprise.* *skills:* *- to manage resources at enterprises,* *- to assess the value of resources and the risks associated with reducing the effectiveness of their use;* *- to analyze the consequences of decision-making on resource management of the enterprise;* *- application of modern digital technologies in socio-economic research, design, distribution and optimization of resource flows.*
Instructional Materials	*syllabus, learning materials (textbook, Google Classroom)*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Geo-information Systems of Superuse	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline "Geoinformation systems of subsoil use" the student should be acquainted with the basics of technology of development of mineral deposits in an open way, the existing forms of the deposit and the conditions of its occurrence, have an idea of information technology in mining.*
Scope of the course	*Systematized approach to information on the quantity, quality, degree of geological and technical and economic study of minerals in the field. The level of industrial development of subsoil. Computer hardware that ensures the functioning of databases and software information systems.*
Rationale	*Working with the geographic information system of mineral deposits does not require specialized software, but the acquired knowledge of geology, construction, industrial waste, etc., is necessary to assess the geographic information system of subsoil use in general. Database management, its filling process and resource updating are possible from smartphones and tablets via a mobile mapping application.*
Learning outcomes	*Expected learning outcomes include:* *- Carry out reasonable development of development plans of the mining enterprise and directions of further geological study of subsoil.* *- To provide rational and complex development of deposits in the course of their industrial use.* *- Use information and communication technologies in subsoil use.* *- Perform geodetic monitoring of the earth's surface, natural objects, engineering structures.* *- Be able to assess the quality of topographic and cartographic products.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *- perform work on accounting, storage and analytical processing of statistical, geological, geophysical, hydrogeological and engineering-geological results of subsoil research.* *- monitor the geological environment and mineral resources of the districts.* *- carry out reference and information services to users by providing information on request in the form of passports or their individual parts.* *- identify violators of subsoil use with the ability to leave a photo fact of the violation, the coordinates of the situation, etc.* *- solve specific tasks in the planning and execution of survey work and computer processing of survey results in geographic information systems.*
Instructional Materials	*Textbooks, tutorials, video lectures, Google Classroom courses*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Information Technologies in Nature Protection	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Basic knowledge of higher mathematics, physics, computer science, ecology, basics of open pit mining, forms and conditions of deposits*
Scope of the course	*World experience in the application of digital technologies in mining, a set of mathematical models of mining processes, a package of applied computer programs for the implementation of these models.*
Rationale	*At the present stage of mining development, digital technologies of technological processes are being introduced in the world. Therefore, the formation of future specialists of theoretical and practical knowledge in the field of digital technologies in nature management is important and necessary*
Learning outcomes	*Expected learning outcomes include:* *- Be able to implement digital technologies in the processes of opencast mining;* *- Be able to use information from technical documentation and reference files; work with information from various sources and use the basic functionality of network technologies;* *- Be able to use Internet resources to collect, visualize and use spatial information*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *– To develop projects on environmental protection and manage complex actions for their implementation.* *- To determine ways to solve applied problems in the field of nature management on the basis of the modern direction of information technology development.*
Instructional Materials	*Textbooks, tutorials, video lectures, Moodle courses, Google Classroom,*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Geoinformation Systems of Construction Objects	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of geological concepts and processes, ideas about mining, underground structures and basics of construction, informatics.*
Scope of the course	*Geoinformation systems that designed to collect, store, analyze and visualize (issue) spatial data. Scientific substantiation, design, creation, operation and use of information systems.*
Rationale	*The discipline is the basis for the formation of engineering approaches to the automated design of construction projects for various purposes. Reduces the risks associated with human exposure.*
Learning outcomes	*Expected learning outcomes include:* *- assess the location of social infrastructure in the areas of construction, taking into account the existing infrastructure of the surrounding areas;* *- to design engineering communications of the building area taking into account a relief of district and type of soil.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to skills:* *- determine the required amount of equipment, forces and means to perform construction work;* *- assess the impact of construction projects on the environment;* *- to determine the nearest suppliers of construction and finishing materials, specialized organizations that provide engineering and other services necessary during the construction process.*
Instructional Materials	*Textbooks, tutorials, Google Classroom courses, monographs*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Designing of Opencast Mining Enterprises	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Knowledge of the basics of mining and development of mineral deposits in the open way, basic knowledge of geology, geomechanics, computer and mathematical modeling, knowledge in the field of ecology*
Scope of the course	*Purpose and content of a pit project, organization of design work, design methods, including computer-aided design systems, mathematical models of deposits, design of mine workings and systems for the development of mineral deposits, economic foundations of a pit project, land reclamation*
Rationale	*The study of the discipline will allow the student to navigate in modern methods and approaches to the design of highly productive and environmentally friendly mining enterprises*
Learning outcomes	*Expected learning outcomes include:* *- Apply the acquired knowledge in the organization and justification of the career project;* *- select and apply methods to determine the contours, depth and productivity of the quarry;* *- apply existing technologies of mineral development in the extraction of minerals.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* *- collect and analyze the initial and necessary for the design of the mining enterprise information;* *- to compile project documentation, feasibility study of design decisions taking into account the regulatory framework;* *- substantiate the contours of the quarry and its depth on the basis of existing methods;* *- substantiate and determine the optimal productivity of the quarry and the speed of development of mining operations on the basis of existing design methods;* *- to analyze and choose the schemes of disclosure and development systems taking into account the mining and technical parameters.*
Instructional Materials	*syllabus, learning materials (textbook, Google Classroom)*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

Thermodynamics of Stability of Quarry Sides and Dumps	
Restrictions (specialty for which the course is offered)	*184 Mining*
Educational level	*Second level (Master's degree)*
Year of study	*1 (2 semester)*
Number of ECTS credits	*4 (120 hours)*
Language of study	*English*
Department	*Geoengineering*
Assumed knowledge and prerequisites	*English B2. Before studying the discipline of the basics of thermodynamics, general knowledge about the development of minerals in the open way, the mechanics of deformation and destruction of rocks*
Scope of the course	The sides of the quarry, as objects of protection, change their hermodynamic characteristics both under the influence of static and dynamic man-made influences, and over time. This negatively affects their stability and, as a consequence, the safety of mining. The developed stochastic dynamic models of deformation and destruction of rocks will allow to predict and provide stability of sides of quarries for all time of development of minerals.
Rationale	*The educational component contributes to the acquisition of knowledge - the structure of the field of deformations and stresses in the contour part of the quarry wall;* *- Theories of the limiting state of rocks;* *- criteria for the static stability of the quarry walls;* *- Stochastic dynamic non-stationary models of pit wall stability;* *- Carnot cycle during deformation and destruction of a rock element;* *- entropy criterion for the evolution of career sides;* *- a strong dynamic model of the evolution of the sides of a career in time;* *- Calculation of the parameters of the pit walls, taking into account the forecast of its stability.*
Learning outcomes	Based on the results of knowledge acquired in the discipline, the master can choose the most adequate mathematical model and engineering methods for forecasting the stability of quarry sides in the process of quarry design and during the current control of stability of quarry sides and dumps during operation
Competencies and skills	*Upon successful completion of the course students are expected to be able to:* - Apply modern mathematical models of modeling - Develop engineering techniques to assess the current state of the quarry sides and the reliability of its change over time in the development of mineral reserves - Introduce in the quarry a scientifically sound procedure for working off stocks with minimal costs to protect the sides from collapsing
Instructional Materials	*syllabus, learning materials (textbook, Google Classroom)*
Mode of delivery	*Lectures, workshops*
End-of-semester control	*Test*

163 Biomedical Engineering

Registration and Processing of Biosignals and Medical Images	
Restrictions (specialty for which the course is offered)	*163 Biomedical Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	*3*
Number of ECTS credits	*4*
Language of study	*English*
Department	*Biomedical Engineering (the course is taught by the Department of Electronic Engineering of the Faculty of Electronics)*
Assumed knowledge and prerequisites	*English B2, programming skills*
Scope of the course	*The scope of the course includes 26 hours of lectures, 28 hours of practical, 28 hours of laboratory*
Rationale	*The educational component "Registration and processing of biosignals and medical images" contributes to the development of professional expertise in knowledge of methods for processing and analysis of biomedical signals of different nature. The main purpose of the discipline is to form a holistic view of signals and methods of their study, as well as the acquisition of knowledge, skills, abilities and experience in using methods of registration, processing and analysis of biosignals and images in practice.*
Learning outcomes	*Expected learning outcomes include knowledge of:* *1. types and parameters of signals and images of different nature, including biomedical;* *2. methods of mathematical description of linear stationary discrete systems;* *3. methods of spectral, spectral-temporal, wavelet and correlation analysis, conditions and limitations in their application;* *4. the essence of frequency-dependent signal processing using filters;* *5. basic approaches to stochastic, nonlinear and multivariate signal analysis and pattern recognition;* *6. trends in signal theory and application of signal research methods in the specialty.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to have:* *– Ability to apply knowledge in practical situations.* *– Knowledge and understanding of the subject area and understanding of professional activity.* *– Skills in the use of information and communication technologies.* *– Ability to perform research at the appropriate level.* *– Ability to search, process and analyze information from various sources.* *– Ability to generate new ideas (creativity).* *– Ability to make well-grounded decisions.*
Instructional Materials	*syllabus, learning materials (video lectures, tutorial for laboratory works)*
Mode of delivery	*Lectures, workshops , tutorials*
End-of-semester control	*Test*

Analog and Digital Circuits Design-1. Analog Circuit Design	
Restrictions (specialty for which the course is offered)	*Biomedical Engineering*
Educational level	*First level (Bachelor's degree)*
Year of study	*3*
Number of ECTS credits	*4,5*
Language of study	*English*
Department	*Biomedical Engineering*
Assumed knowledge and prerequisites	*English B2*
Scope of the course	*The scope of the course includes 36 hours of lectures, 18 hours of practical, 18 hours of laboratory*
Rationale	*The educational component contributes to the development of professional expertise in analysis of analog circuits, development of analog circuits of functional units and electronic devices.*
Learning outcomes	*Expected learning outcomes include:* *– Possession of engineering methods for calculation of elements of devices and systems of medical use and a choice of classical and newest constructional materials.* *– Knowledge of design tools for devices, appliances and systems of medical and biological purposes.* *– Knowledge of methods of designing digital and microprocessor systems for medical purposes .* *– Apply knowledge of the basics of mathematics, physics and biophysics, bioengineering, chemistry, engineering graphics, mechanics, resistance and strength of materials, properties of gases and liquids, electronics, computer science, obtaining and analyzing signals and images, automatic control, systems analysis and decision making methods at the level required to solve the problems of biomedical engineering.* *– Understanding of theoretical and practical approaches to the creation and management of medical equipment and medical technique.*
Competencies and skills	*Upon successful completion of the course students are expected to be able to have:* *– Ability to apply knowledge in practical situations.* *– Knowledge and understanding of the subject area and understanding of professional activity.* *– Ability to communicate in the state language both orally and in writing.* *– Skills in the use of information and communication technologies.* *– Ability to perform research at the appropriate level.* *– Ability to search, process and analyze information from various sources.* *– Ability to generate new ideas (creativity).* *– Ability to make well-grounded decisions.* *– Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity).* *– Safe activities skills.*
Instructional Materials	*syllabus, learning materials (manual for the students for Laboratory works on the course "Analog Circuit Design", presentation of lectures, auxiliary materials for practice)*
Mode of delivery	*lectures (tutorials)*
End-of-semester control	*Exam*