

**MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN
"NJSC "S. SEIFULLIN KAZAKH AGROTECHNICAL UNIVERSITY"**

Approve
NJSC "Saken Seifullin Kazakh
Deputy Chairman of the Management
Board Academic Activity-Rector
_____ A.M Abdyrov.
« _____ » _____ 2021.

CATALOG OF ELECTIVE COURSES

For students in groups of educational programs

6B07105-Mechanical Engineering

Nur-Sultan, 2021

**MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN
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Brief description of elective disciplines of the educational program

Clinical diagnosis

1	Name of course	Physical and colloid chemistry
2	Code of course	FKH 2215
3	Cycle of course	BD
4	Amount of credits	10
5	Level of preparation	Undergraduate studies
6	Department	The Department of Physics and Chemistry
7	Year	2
8	Prerequisites	School Chemistry course
9	Postrequisites	Materials in engineering design, Calculation and design of food production machines, Technological processes and devices of food production, Fundamentals of engineering
10	Course summary	Expansion and deepening of knowledge in the course of chemistry, the study of the theoretical foundations of chemistry, the basic concepts of chemistry, the basics of qualitative analysis, the formation of the concept of the role of chemistry
11	Learning outcomes	The acquired knowledge in chemistry helps future specialists of the agricultural industry to solve the problems of increasing the yield of agricultural crops, which are associated with the study of the composition of soils, the determination of macro- and microelements in them

1	Name of course	Machines and Apparatus for Processing Livestock Products
2	Code of course	MAPPZh 3219
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	The Department of Technological Machines and Equipment
7	Year	3
8	Prerequisites	Fundamentals of technology of processing industries, Thermal and refrigeration equipment of food production,
9	Postrequisites	Machines and devices for processing plant products, Calculation and design of food production machines, Lifting and transport installations of food production, Installation, testing and operation of technological machines
10	Course summary	Production and technological characteristics of livestock enterprises. Mechanization; water supply of farms and pastures, procurement and distribution of feed and means of mechanization of feed storages, milking of farm animals, primary processing, milk processing, technological processes in sheep farming, technological processes in poultry farming, removal, transportation and preparation of manure for use. Machines and equipment for the preparation of feed and feed mixtures and a system for forming microclimate parameters in livestock premises. Operation of machinery and equipment of livestock farms and organization of their technical service. Technological bases of design of livestock enterprises.
11	Learning outcomes	Be able to correctly solve the issues of mechanization of production processes on farms of various forms of ownership from the position of a systematic approach, design and complete production lines, manage installation and commissioning works, and evaluate the quality and efficiency of livestock mechanization tools.

1	Name of course	Machines and equipment for processing of crop products
2	Code of course	MAPPR 3220
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	The Department of Technological Machines and Equipment
7	Year	3
8	Prerequisites	Fundamentals of technology of processing industries, Thermal and refrigeration equipment of food production, Machines and apparatuses for processing animal products,
9	Postrequisites	Calculation and design of food production machines, Lifting and transport installations of food production, Installation, testing and operation of technological machines
10	Course summary	Methods for determining the forces acting on working bodies, Requirements for the quality of technological operations performed by working bodies, Operational requirements, solving mathematical models. Principles of performing technological operations by a working body The importance of combining operations for resource-saving technologies and machine efficiency regularities of calculating working bodies The relationship of working bodies in the functional scheme of a machine or tool. Determination of the number of working bodies and their location on the machine frame for high-quality performance of the technological process. The movement of the processed materials in accordance with the purpose of the machine, the sequence of the location of the working bodies determining the performance of the designed machine, the processes during the transition of the material from one working body to another, Their impact on the reliability of the technological process. Display of the functional structure on the diagram of the designed machine. Functional indicators of machines and aggregates. Economic feasibility of modernization
11	Learning outcomes	Know the main methods of preparing plant products for processing; traditional and modern methods of processing plant products; factors affecting the safety of plant products; technological schemes of complex processing of plant products and waste disposal

1	Name of course	Fundamentals of technology processing industries
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2	Code of course	OTPP 1214
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	The Department of Technological Machines and Equipment
7	Year	1
8	Prerequisites	Physics, mathematics
9	Postrequisites	Machines and apparatuses for processing plant products, Machines and apparatuses for processing animal products
10	Course summary	Processes and devices of processing industries. General patterns of technological processes. Classification of processing production processes. Modeling of processes and devices. Basic similarity theories. Hydro-mechanical processes: crushing, cutting, sorting of bulk materials, filtration, centrifugation; processes in the pseudo-liquefied layer. Thermal processes: heating, cooling, condensation, evaporation. Mass transfer processes: fundamentals of the theory of mass transfer, sorption and desorption, crystallization, drying, distillation. Non-traditional processes and devices of processing industries. The main types of devices and their design features. Methods of calculation of operating parameters and justification of operating modes of technological equipment for primary processing of raw materials of processing industries.
11	Learning outcomes	The ability to use in the practice of scientific research knowledge about the basic properties of food products and raw materials, the kinetic laws of the main processes of food technology, the general principles of calculating devices

1	Name of course	Electrical engineering and bases of electronics
2	Code of course	EOE 2216
3	Cycle of course	BD
4	Amount of credits	5

5	Level of preparation	Undergraduate studies
6	Department	The Department of Electric Power Supply
7	Year	2
8	Prerequisites	Physics, mathematics
9	Postrequisites	Automated electric drive, Electric Machines and Drives, Industrial Controllers, CNC System (Fundamentals of Mechatronics)
10	Course summary	When studying the discipline, the fundamental training of the student in the field of general electrical engineering and electronics is provided; there is a connection with the disciplines "mathematics", "physics" and "chemistry" and continuity in the use of computers in the educational process, there is an acquaintance with the core problems of obtaining, transmitting and converting electrical energy, basic provisions on electric drive and modern electronic base used in automatic control schemes, skills and concepts of professional terminology required for the solid assimilation of subsequent disciplines and the practical use of the acquired knowledge in solving professional problems.
11	Learning outcomes	Practical application of knowledge of the theoretical foundations of electrical engineering, electronics and microprocessor technology, the ability to understand technical devices, diagrams, tables, tests and graphs of electronic devices

1	Name of course	Automatic electric driver
2	Code of course	AE 2217
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	The Department of Operating Electra Equipment
7	Year	2
8	Prerequisites	Descriptive Geometry and Engineering Graphics, Physics, Mathematics, Electrical Engineering and the Basics of Electronics
9	Postrequisites	Industrial controllers, CNC System (Fundamentals of Mechatronics)

10	Course summary	Fundamentals of Intellectual Property law. Types of intellectual property rights objects. International agreements. The history of the development of Kazakhstan's legislation on the protection of intellectual property. The system of sources of legal regulation of relations related to the protection of intellectual property. International Patent system. World Intellectual Property Organization (WIPO). International conventions on intellectual property issues. procedure for registration and filing of an application for an invention and utility model, procedure for consideration of applications in the patent office; types of decisions of the patent office on applications; rights and privileges of inventors; the concept and types of licenses, the economy of inventions. Preparation and submission of the application. Preparation of claims and utility models. Preparation of an application for an invention, utility model and industrial design. Examination of the application. Grant of a patent or certificate. The validity of patents and copyright certificates issued before the introduction of modern patent legislation. The rights of the authors of inventions, utility models and industrial designs. Patent rights and their protection. Content of patent rights. Duties of the patent owner.
11	Learning outcomes	Be able to connect electric machines to the electrical network, conduct tests of electric machines and electric drives, calculate the working and mechanical characteristics of electric machines, choose the type and power of electric motors for various operating modes, perform the calculation of electromechanical transients of electric drives

1	Name of course	Industrial controllers
2	Code of course	PK 3222
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	The Department of Operating Electra Equipment
7	Year	3
8	Prerequisites	Mathematics, Physics, Electrical Engineering, Electrical Machines and Drives
9	Postrequisites	Pneumatic and hydraulic drives, CNC system (Fundamentals of mechatronics), Manipulators and robots
10	Course summary	General information about controllers. Architecture and types of PLCs. Structure and structure of ARIES controllers. Programming and interface of ARIES controllers. Additional ARIES modules. Installation of ARIES modules. Structure and structure of SIEMENS controllers. Programming and interface of SIEMENS controllers. Additional SIEMENS modules. Installation of SIEMENS modules. Structure and structure of Schneider Electric controllers. Programming and interface of Schneider Electric controllers. Additional modules of Schneider Electric. Installation of Schneider Electric modules. Design of automation systems.

11	Learning outcomes	the ability to plan the commissioning, maintenance and testing of individual modules and subsystems, to participate in the organization and conduct of installation, commissioning and maintenance at existing facilities and experimental models, as well as in the processing of the results of experimental studies
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1	Name of course	Production management
2	Code of course	PM 4312
3	Cycle of course	PD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	The Department of Management
7	Year	4
8	Prerequisites	Economic theory, higher mathematics microeconomics.
9	Postrequisites	Diploma design
10	Course summary	Agro-industrial complex. The market in the agro-industrial complex. Economic foundations of market mechanisms of management. Fixed assets of agricultural production. Labor resources. Production costs and production costs. Pricing and pricing system. Agricultural production and its economic efficiency. Management development: essence and principles. The essence and main types of the organization. Management functions: planning and organization. Management functions: motivation and control. Connecting processes in management. Marketing management: elements and processes. Market segmentation. Product policy in marketing
11	Learning outcomes	The purpose of the course: to prepare students for work in a market economy. This course provides students with the basics of knowledge of economic laws and forms of their application in agricultural production, the relationship of agriculture with other areas of the economy; training students in effective management of agricultural enterprises by studying the experience, the science of management and marketing, mastering the skills inherent in the manager.

1	Name of course	Mechanics of liquid and gas
2	Code of course	MZhG 3223
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	The Department of Power System
7	Year	3
8	Prerequisites	Mathematics, Physics, Physical and Colloidal Chemistry,
9	Postrequisites	CNC system (Fundamentals of mechatronics), Lifting and transport installations of food production
10	Course summary	Basic Physical Properties of Liquids and Gases, Fundamentals of Hydrostatics, Fundamentals of Kinematics, Basic Equations of Hydrodynamics, Fluid Motion Modes and Fundamentals of Hydraulic Similarity, Laminar and Turbulent Fluid Motion, Local Hydraulic Resistances, Fluid Flow through Holes and nozzles, Hydraulic Calculation of Pipelines, Unsteady Fluid Motion, Interaction of Flow with Walls, Vane Hydraulic Machines, General information about Hydraulic Machines, Fundamentals of the theory of Vane Hydraulic Machines, Operational Calculations of Vane Pumps, Vortex and Jet Pumps, Hydrodynamic gears, Volumetric hydraulic machines, hydraulic drives and hydraulic automation, General information about volumetric hydraulic machines, Piston and plunger pumps, Rotary pumps, General information about volumetric hydraulic drive, Hydraulic motors, Hydraulic equipment and elements of hydraulic automation, Hydraulic drive schemes and hydraulic automation system, Tracking hydraulic drive, Pneumatic drive
11	Learning outcomes	Know the basic laws of equilibrium and motion of liquids and gases and how to apply these laws to solving practical problems of mechanical engineering; the basics of calculating hydraulic and pneumatic systems of machines and equipment;

1	Name of course	Thermal and refrigerating equipment of food production
2	Code of course	THOPP 3218
3	Cycle of course	BD
4	Amount of credits	3
5	Level of preparation	Undergraduate studies
6	Department	The Department of Power System
7	Year	3
8	Prerequisites	Physics, Fundamentals of Processing Technology, Electrical Engineering and Fundamentals of Electronics, Automated Electric Drive
9	Postrequisites	Livestock products processing machines and apparatuses, Machines and devices for processing plant products, Calculation and design of food production machines, Technological processes and devices for food production
10	Course summary	Equipment for heat and cold treatment. The role of heat transfer and mass transfer in technical processes. Thermal equipment in public catering. Classification of heat treatment methods in the OP. General principles of the device of thermal devices OP. Designs of some types of heating devices in public catering. Devices for hydrothermal and thermal processing of grain, cereals and feed components. Dryers in the food industry. Equipment for freezing food products. Design features of self-unloading separators. Fundamentals of the theory of the centrifugal separation process. Basic requirements for heat exchangers. Features of plate and tube heat exchangers
11	Learning outcomes	Know the basics of the kinetics and dynamics of the main technological processes; be able to perform calculations of processes, devices, machines; acquire skills in solving typical project tasks of the course.

1	Name of course	Calculation and design of food production machines
2	Code of course	RPMP 4225
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	The Department of Technological Machines and Equipment
7	Year	4
8	Prerequisites	Fundamentals of technology of processing industries, Machines and devices for processing animal products Machines and devices for processing plant products, Technological processes and devices for food production, Installation, testing and operation of technological machines
9	Postrequisites	Diploma design
10	Course summary	Historical aspects, prospects for the development and improvement of food equipment. General issues of designing machines and apparatuses. Executive mechanisms of machines. Vibrating equipment for food production. Thermal and capacitive equipment. Machines with rotating working bodies. Machines with reciprocating movement of working bodies. Modern methods of experimental research and industrial testing of technological equipment.
11	Learning outcomes	To know the methodological, regulatory and guidance material relating to the work performed; problems the creation of machines of various types, drives, systems, principles of operation, technical characteristics, design features developed and used technical means; research methods terms and conditions of execution of works, main technosphere danger, their properties and characteristics the impact of harmful and dangerous factors on the human and natural environment, methods of protection against them as regards the scope of their professional activities.

1	Name of course	Hoisting and transport installations of food productions
2	Code of course	PTUPP 4221
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	The Department of Technological Machines and Equipment
7	Year	4
8	Prerequisites	Fundamentals of technology of processing industries, Automated electric drive, Fluid and gas Mechanics, Technological processes and devices of food production, Installation, testing and operation of technological machines
9	Postrequisites	Diploma design
10	Course summary	Hydrostatics. Hydrodynamics. Volumetric hydraulic drives. Working fluids. Volumetric hydraulic machines. Hydraulic equipment. Determination of parameters and selection of hydraulic drive and hydraulic equipment. Pneumatic actuators. Calculation of pneumatic actuators
11	Learning outcomes	Know the basics of hydraulics, hydraulic drives, hydraulic machines, hydraulic equipment and working fluids. Be able to calculate and select hydraulic and pneumatic actuators

1	Name of course	Technological processes and apparatus of food production
2	Code of course	TPAPP 3224

3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	The Department of Technological Machines and Equipment
7	Year	3
8	Prerequisites	Fundamentals of technology of processing industries, Thermal and refrigeration equipment of food production, Materials in engineering design
9	Postrequisites	Machines and devices for processing plant products, Calculation and design of food production machines, Lifting and transport installations of food production, Installation, testing and operation of technological machines
10	Course summary	Development of theoretical knowledge in the field of processes and devices of food production, as well as the acquisition of skills to apply this knowledge in professional activities in solving both specific production tasks and promising issues related to the rationalization of processes and the improvement of devices.
11	Learning outcomes	Be able to choose modern devices and machines that best meet the characteristics of the technological process. Confirm with engineering calculations the compliance of the devices with the conditions of the technological process

1	Name of course	Fundamentals of Engineering
2	Code of course	OI 4226
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	The Department of Technological Machines and Equipment

7	Year	4
8	Prerequisites	Fundamentals of technology of processing industries, Machines and devices for processing animal products Machines and devices for processing plant products, Technological processes and devices for food production, Installation, testing and operation of technological machines
9	Postrequisites	Diploma design
10	Course summary	Force systems and equilibrium conditions with an emphasis on engineering problems. Kinematics and kinematics of material points, systems of material points and solids; Application of these topics to engineering problems
11	Learning outcomes	To know the basic concepts and laws of mechanics in the form of axioms, theorems, principles arising from these laws, methods of studying equilibrium, skills necessary for the subsequent study of special engineering disciplines, as well as in his further professional activity directly in the production environment. The ability to make practical calculations for equilibrium, determination of kinematic characteristics and dynamic analysis of mechanical systems.