S.Seifullin Kazakh Agrotechnical University

Confirm
S.Seifullin Kazakh Agrotechnical University
Dean of the Technical Faculty
_____ E. Akhmetov
«____» _____ 2022г.

CATALOG OF ELECTIVE DISCIPLINES

For students in the direction of preparation 7M087 Agricultural engineering

Brief description of the elective disciplines of the educational program

EPG	EP	Form of education	The name of discipline	Code of subject	Discipline cycle	Component	Number of credits	Level of training	Cafedra	Course	Academic period	Pre-requisitions	Post-requisitions	Brief content of the discipline	Key learning outcomes	Name of the alternative discipline
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Theoretical foundations of the mechanization of agricultural production	TOMSP 5305	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Mechanization of technological processes	1	1	Bachelor's course-Engineering mathematics, Theory and evaluation of agricultural machines, Fundamentals of design and build of agricultural machinery and equipment	Basics of scientific research, Engineering design, Farming systems and crop production, GIS and remote sensing technologies, Planning of experiments, Technical support of technological processes in the system of precision farming	Theory and calculation of modern machines and tools for tillage. Theoretical foundations of mechanical tillage. Energy assessment of tillage machines. Technological process and calculation of the basic parameters of machines for applying organic and mineral fertilizers. The calculation of the main working bodies and modes of operation of the feed, harvest, grain cleaning and sorting machines. Theories of livestock mechanization processes, setting the machine for a given mode of operation. Key questions on the substantiation of the main parameters and modes of operation of the working bodies, mechanisms of agrotechnological machines and their design.	Increasing the ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of the engineering and technical sphere of the agro-industrial complex. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Knowledge of the basic provisions of the system of agriculture and crop production, the use of digital technologies in the management of the process of cultivation of agricultural crops	Digital technology in Plant Growing
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Digital technology in Plant Growing	CTR 5313	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Agriculture and plant growing	1	1	Planning of experiments,Farming systems and crop production	Digital technology in Plant Growing, GIS and remote sensing technologies, Precision Farming Technology, Theoretical foundations of the mechanization of agricultural production	Features of the use of GIS in crop production, the main functions and examples of geographic information systems. Technological approaches to the introduction of precision farming in the production of crop products. Database of personnel, customers, farm fields, mobile energy facilities, agricultural machinery. Mapping of fields in the system of precision agriculture. Normalized Vegetation Index NDVI (Normalized Difference Vegetation Index). The use of ICT in the production of crop products. Tablet agronomist.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. Increasing the ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of the engineering and technical sphere of the agro-industrial complex. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions.	Theoretical foundations of the mechanization of agricultural production
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Math modeling	MM 5203	BS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)		1	2	Bachelor's course-engineering mathematics, computer-Aided Mechanism Design, engineering mechanics (Statics, Dynamics)	Higher Engineering Mathematics, Master student's research work, including implementation of master's thesis, Precision Farming Technology, Similarity basics, Technical support of technological processes in the system of precision farming	Partial differential equations. Boundary value problems. Mathematical analysis of the biology model. Standard models in ecology and evolution. Analysis of the stability of linear and nonlinear models, eigenvalues and eigenvectors, probability theory and mathematical statistics. Methods of mathematical modeling for the analytical and numerical solution of linear and nonlinear ordinary and partial differential equations	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions	GIS and remote sensing technologies

M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	GIS and remote sensing technologies	TGDSH 5211	BS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Geodesy and cartography	1	2	Bachelor's course-Precision agriculture basics	Engineering design, Planning of experiments, Precision Farming Technology, Technical support of technological processes in the system of precision farming	GIS and RS: Coordinate systems. Positioning systems. Cartographic projections. Electronic maps, layers. Digital image. Multispectral image. Hyperspectral image. Satellites. UAV. Creating a spatial database. Features of data storage organization. Digitization of data. Photogrammetry. Processing of remote sensing data. Data analysis: Spatial analysis. Methods of classification. Types of classified data. Identification of crop types using remote sensing data. Detection of crop diseases using remote sensing data. Identification of the main properties of the soil using remote sensing data.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the agriculture direction.Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Knowledge of the basic provisions of the system of agriculture and crop production, the use of digital technologies in the management of the process of cultivation of agricultural crops	Math modeling
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Computer modelling	KM 5204	BS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Information systems	1	2	Bachelor's course-Computer graphics, Draft execution automation, Computer-Aided Mechanism Design	Engineering design, Higher Engineering Mathematics, Planning of experiments, Research practice	ntroduction to computer modeling. The history of the emergence of modeling. The concept of a model, modeling, model adequacy. Goals and objectives of the simulation. The process of modeling. Classification of models. Types of classification models. Material (physical) and ideal models. Cognitive, informative, conceptual, formal models. Computer models. Business modeling. Business modeling tools. Models used in business. Business Process Analysis Methodologies. Description of the ARIS business modeling tool. Methods of building models using the ARIS system. Math modeling. Mathematical model. Classification of models. The main stages of mathematical modeling. Random number generation. Simulation. Basic concepts of simulation. The tasks of simulation. Scopes of models. Stages of building models. Advantages and disadvantages of simulation modeling. Queuing systems. Queuing theory. The composition of queuing systems. Types of queuing systems. Simulation model of queuing systems. Complex systems. Dynamic systems. Object Oriented Modeling. Approaches to visual modeling of complex dynamic systems.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions	Management and Decision making in Precision Agriculture, Simulation systems
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Simulation systems	MS 5210	BS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Computer science	1	2	Bachelor's course-engineering mathematics, computer graphics, engineering mechanics (Statics, Dynamics)	Higher Engineering Mathematics, Precision Farming Technology	The concept of optimization of processes, parameters of structures and devices in engineering production. Making decisions. The basic principles of constructing and analyzing models. The concepts of the object and subject of study. Methods for constructing mathematical models. The main methods for solving equations of mathematical models in agroengineering.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions. Apply your knowledge at a professional level, in a broader interdisciplinary context and the ability to master the culture of thinking, correctly express your thoughts in written and oral speech.	Computer modelling, Management and Decision making in Precision Agriculture
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Management and Decision making in Precision Agriculture	MPRTSH 5212	BS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Management and marketing	1	2	Bachelor's course-Production management, Engineering economics	Farming systems and crop production, Higher Engineering Mathematics	Decision making in agricultural management. The calculation of economic efficiency, the use of digital technology and technology. General aspects of crop production. Crop production. Indicators of economic efficiency of crop production. General aspects of animal husbandry. Aggregation of feed production. Indicators of economic efficiency in the production of dairy products. Financial analysis and financial planning. Application of various methods of program planning in decision making.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions. Apply your knowledge at a professional level, in a broader interdisciplinary context and the ability to master the culture of thinking, correctly express your thoughts in written and oral speech.	Computer modelling, Simulation systems

M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Theoretical foundations of the mechanization of agricultural production	TOMSP 5307	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Mechanization of technological processes	1	2	Bachelor's degree course - Engineering Mathematics, Fundamentals of design and construction of agricultural machinery and equipment, Agrotechnological machines, Theory and calculation of agricultural machinery	Basics of scientific research, Engineering design, Farming systems and crop production, Planning of experiments, Precision Farming Technology	Theory and calculation of modern machines and tools for tillage. Theoretical foundations of mechanical tillage. Energy assessment of tillage machines. Technological process and calculation of the basic parameters of machines for applying organic and mineral fertilizers. The calculation of the main working bodies and modes of operation of the feed, harvest, grain cleaning and sorting machines. Theories of livestock mechanization processes, setting the machine for a given mode of operation. Key questions on the substantiation of the main parameters and modes of operation of the working bodies, mechanisms of agrotechnological machines and their design.	Increasing the ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of the engineering and technical sphere of the agro-industrial complex. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Knowledge of the basic provisions of the system of agriculture and crop production, the use of digital technologies in the management of the process of cultivation of agricultural crops	Digital technology in Plant Growing
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Digital technology in Plant Growing	CTR 5314	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Agriculture and plant growing	1	2	Bachelor's course-Precision agriculture basics	Farming systems and crop production, Planning of experiments, Technical support of technological processes in the system of precision farming	Features of the use of GIS in crop production, the main functions and examples of geographic information systems. Technological approaches to the introduction of precision farming in the production of crop products. Database of personnel, customers, farm fields, mobile energy facilities, agricultural machinery. Mapping of fields in the system of precision agriculture. Normalized Vegetation Index NDVI (Normalized Difference Vegetation Index). The use of ICT in the production of crop products. Tablet agronomist.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. Increasing the ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of the engineering and technical sphere of the agro-industrial complex. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions.	Theoretical foundations of the mechanization of agricultural production
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Similarity basics	OP 5205	BS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Computer science	1	3	Basics of scientific research, Basics of scientific research	Engineering design, Planning of experiments, Precision Farming Technology, Technical support of technological processes in the system of precision farming	Dimension theory. Units. Formula of dimensions. Unit systems. Transformation systems and their application. Algebraic method for constructing dimensionless complexes. Similarity theory. Similarity in mathematics. Similarity parameters. Similarity in physics. Similar points. Similarity criteria. Types of criteria and physical meaning. Similarity theorems. The boundaries of their application. Obtaining criteria by the cast method. Criterial equations and their receipt. Similarity criteria in thermal conductivity. Unsteady heat conduction. Fourier number. Heat transfer and Nusselt number. Forced kinvektsiya. Reynolds number. Heat transfer during forced convection. The numbers Pecleos and Stantona. Thermal and dynamic boundary layers. Prandtl number. Free convection Galileo number. Archimedes number. Heat transfer with free convection. Grashof number Rayleigh number. Similarity in hydraulics. Euler number.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. Increasing the ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of the engineering and technical sphere of the agro-industrial complex.Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions	Higher Engineering Mathematics
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Higher Engineering Mathematics	VIM 5213	BS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Higher mathematics	1	3	Bachelor's course-engineering mathematics	Planning of experiments, Technical support of technological processes in the system of precision farming	Partial differential equations. Boundary value problems. The solution of linear and nonlinear ordinary and partial differential equations. Fourier transform methods, Laplace transforms, mathematical models of processes and phenomena.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Possess the skills and ability to model, analyze, identify and solve technological and operational tasks by integrating knowledge, making judgments and making decisions	Similarity basics

M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Technical support of technological processes in the system of precision farming	TOTPSTZ 5309	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Technical mechanics	1	3	GIS and remote sensing technologies,Theoretical foundations of the mechanization of agricultural production, Digital technology in Plant Growing	Engineering design, Precision Farming Technology, Technical support of technological processes in the system of precision farming	Positioning systems. Local sampling in the coordinate system. Parallel driving system. Create prescription maps. Differentiated tillage. Differentiated sowing. Differential fertilization. Differential application of pesticides. Yield monitoring. Sensory. Mapping yield and electrical conductivity. Robotic systems in agriculture.	Increasing the ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of the engineering and technical sphere of the agro-industrial complex. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Knowledge of the basic provisions of the system of agriculture and crop production, the use of digital technologies in the management of the process of cultivation of agricultural crops	Precision Farming Technology
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Precision Farming Technology	VTSH 5315	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Technical mechanics	1	3	GIS and remote sensing technologies,Theoretical foundations of the mechanization of agricultural production, Digital technology in Plant Growing	Master student's research work, including implementation of master's thesis, Planning of experiments, Precision Farming Technology	Positioning systems. Local sampling in the coordinate system. Parallel driving system. Create prescription maps. Differentiated tillage. Differentiated sowing. Differential fertilization. Differential application of pesticides. Yield monitoring. Sensory. Mapping yield and electrical conductivity. Robotic systems in agriculture.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Knowledge of the basic provisions of the system of agriculture and crop production, the use of digital technologies in the management of the process of cultivation of agricultural crops	Technical support of technological processes in the system of precision farming
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Technical support of technological processes in the system of precision farming	TOTPSTZ 6310	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Technical mechanics	2	1	Farming systems and crop production, GIS and remote sensing technologies,Theoretical foundations of the mechanization of agricultural production, Digital technology in Plant Growing	Master student's research work, including implementation of master's thesis, Research practice	Positioning systems. Local sampling in the coordinate system. Parallel driving system. Create prescription maps. Differentiated tillage. Differentiated sowing. Differential fertilization. Differential application of pesticides. Yield monitoring. Sensory. Mapping yield and electrical conductivity. Robotic systems in agriculture.	Increasing the ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of the engineering and technical sphere of the agro-industrial complex. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Demonstrate readiness to conduct scientific research, calculation and technological work to substantiate the system of machines and equipment for the production of agricultural products. Knowledge of the basic provisions of the system of agriculture and crop production, the use of digital technologies in the management of the process of cultivation of agricultural crops	Precision Farming Technology
M136 - «Vehicles»	7M08702 - «Agroengineering»	Full-time (MS 2 years) trimester	Precision Farming Technology	VTSH 6316	AS	Elective subjects	5.0	Master's program by specialization (Scientific & pedagogical direction)	Technical mechanics	2	1	Farming systems and crop production,GIS and remote sensing technologies	Master student's research work, including implementation of master's thesis, Research practice	Positioning systems. Local sampling in the coordinate system. Parallel driving system. Create prescription maps. Differentiated tillage. Differentiated sowing. Differential fertilization. Differential application of pesticides. Yield monitoring. Sensory. Mapping yield and electrical conductivity. Robotic systems in agriculture.	The ability to plan and conduct experimental research, process experimental data and analyze the results obtained. To know and understand the goals and objectives of production, technological, organizational and managerial activities in the field of engineering systems development in the CX direction. Knowledge of the basic provisions of the system of agriculture and crop production, the use of digital technologies in the management of the process of cultivation of agricultural crops	Technical support of technological processes in the system of precision farming

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head of Fedra E. zh. Kaspakov