

**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

Protective forestation

Nur-Sultan, 2021

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

Social responsibility of business

1	Name of course	Forest soil science
2	Code of course	OT 2210
3	Cycle of course	BS
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Forest resources and forestry
7	Year	2
8	Prerequisites	Forest botany and physiology of woody plants, Dendrology
9	Postrequisites	Forest nursery business, Forestry with the basics of recreational use, Forest crops, Landscaping settlements
10	Course summary	History of the study of forests and forest soils. Subject, tasks and methods of soil science. Soil is the basis of forest biogeocenoses. Ecological functions of soils. Composition and properties of soils. The main processes of formation of soil-forming rocks. The structure of the soil as a natural body. Physical properties of soils. Soil organic matter. Forest litter. Classification of litter and organogenic horizons. The types of soils and their silvicultural characteristics. Soil structure and soil fertility. Genesis and classification of soils. Soil geography. Geography, soil cover structure and forest vegetation properties of forest zone soils. Silvicultural assessment of soils. Anthropogenic soil change. Dynamics of soil cover. Current state of soil cover and anthropogenic transformation of soils. Forest growing conditions and silvicultural assessment of soils. Edaphic features of the main forest-forming species. Mutual influence of soil and forest vegetation properties.
11	Learning outcomes	- to know and understand: features of forest soil as a natural formation and object of afforestation, factors of soil formation and understanding of the soil-forming process connection of soil science with forestry, agriculture, crop production, geology, ecology and other sciences; - be able to: correctly assess and determine the composition, properties and regimes of soils, their change in relation to soil-forming factors and anthropogenic activities; - possess: the ability to analyze, draw conclusions, competently express and argumentatively justify their position on the scientific use of forest soils; on the basic methods of soil protection from harmful effects, to assess the impact of soil formation factors on the formation and development of soil and its properties; - acquire practical skills to independently analyze and evaluate scientific data, special literature, contributing to the growth of professional activity.

1	Name of course	Fundamentals of entrepreneurial activities in forestry
2	Code of course	FOEAIF 2211
3	Cycle of course	BS
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Forest resources and forestry
7	Year	2
8	Prerequisites	Forest nursery business
9	Postrequisites	Forest economics, Forest exploitation, Forest management and forest legislation
10	Course summary	Fundamentals of business in forestry is the science of the main directions of business law, the normative legal acts in the field of business relations, the specifics of business relations.
11	Learning outcomes	As a result of the development of the discipline the student must Know: the Current rules in the field of business relations, the procedure for registration, re-registration, liquidation of legal entities and individual entrepreneurs, regulations of the organization of legal entities, the mechanism of functioning of organizations of various forms of ownership and more. Be able to: - interpret and apply regulations, make legal decisions and perform other legal actions in strict accordance with the law; - carry out preventive work to explain the legislation and law enforcement practice. Possess: skills of working with information sources, educational and reference literature on economic issues. To acquire practical skills: on the basics of entrepreneurial activity of managers and specialists of enterprises.

1	Name of course	Selection of forest tree species
2	Code of course	SOFTS 3212
3	Cycle of course	BS
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Forest resources and forestry
7	Year	3
8	Prerequisites	forest nursery business, forest soil science, forest crops
9	Postrequisites	Forest management, greening of settlements, forest management
10	Course summary	Determination of the source material for selection. Determination of the variability of woody species. Study of mass and individual selection of woody plants in nature on the example of test and geographical cultures. Preparation and carrying out hybridization (production of necessary inventory and equipment). Determination of General and special combinational ability of trees.
11	Learning outcomes	As a result of the study the student should know: - the main methods of modern breeding; supports for selection of plus trees and plantings of the main forest-forming breeds of Kazakhstan. Be able to use breeding methods to produce woody plants with a complex of economically valuable traits. Analyze the results of hybridization, varietal of forest tree species.

1	Name of course	Professionally-oriented Foreign Language
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2	Code of course	POFL 2217
3	Cycle of course	BS
4	Amount of credits	3
5	Level of preparation	Undergraduate studies
6	Department	Forest resources and forestry
7	Year	2
8	Prerequisites	Basic school knowledge, Dendrology, Professional Kazakh (Russian) language, Biometrics in forestry, Ecology and basics of life safety
9	Postrequisites	Forest nursery business, Forest crops, Forest inventory, forest Management
10	Course summary	Forest science; Botanical classification of wood; Basic terms and terminology in dendrology in a foreign language; Terms used in the training of foresters and landscapers. Types of forests-Types of forests; how the tree grows-How a tree grows; Horse system and function-Root structure and function; trunk Structure and function-Stem structure and function; leaf Structure-Leaf structure; forest Health-Forest health; Forests in Kazakhstan-Forests in Kazakhstan; advantages of forests-Forestry advances; Planting a tree to restore the environment - Tree planting for environment restoration;
11	Learning outcomes	Ability to abstract thinking, analysis, synthesis. Readiness for self-development, self-realization, use of creative potential. Readiness to communicate orally and in writing in English to solve problems in the field of forestry. Possession of ability to analyze and planning in the field of forestry Know: - read educational and other literature in a foreign language on forestry for receiving and transmitting information; - give abstracts and reviews of scientific theses and articles in a foreign language; - conduct a conversation, make reports and reports on forestry in a foreign language; Have the skills: -monologue speech on the topic of specialty; - dialogical speech, allowing to participate in the discussion of issues related to his specialty; - conduct conversations on social and socio-political topics; - rate of reading special texts depending on the purpose.

1	Name of course	General biology of organisms
2	Code of course	GBOO 1220
3	Cycle of course	BS
4	Amount of credits	2

5	Level of preparation	Undergraduate studies
6	Department	Department of Biological Sciences
7	Year	1
8	Prerequisites	school base in biology
9	Postrequisites	Microbiology, biotechnology, Ecology and sustainable development, Genetics, ontogeny, phylogeny; Molecular and Cell Biology
10	Course summary	General biology of organisms studies the basic and common laws of life phenomena for all organisms. An overview of living organisms, plant ecology, animal ecology, biology of bacteria and fungi, their interaction with other organisms, soil biocenosis is given. Some questions of morphology, physiology, biochemistry and ecology of organisms are highlighted.
11	Learning outcomes	Know: - The main provisions of biological theories and patterns: cell theory, evolutionary doctrine, the teachings of V.I. Vernadsky about the biosphere, the laws of G. Mendel, patterns of variability and heredity; - Construction and functioning of biological objects - The essence of biological processes: reproduction, fertilization, the action of artificial and natural selection, the formation of fitness, the origin of species - Biological terminology and symbols; be able to: - Explain the role of biology in the formation of the scientific worldview; the contribution of biological theories to the formation of a modern natural-scientific picture of the world; - the unity of living and inanimate nature, the relationship of living organisms; the influence of environmental factors on living organisms, the effect of mutagens on plants, animals and humans; causes and factors of evolution, species variability; sustainability, development and change of ecosystems; the need to preserve the diversity of species; Have the skills to solve elementary biological problems; - to describe the features of species by morphological criterion; - Compare biological objects: the chemical composition of bodies of animate and inanimate nature, natural ecosystems and agroecosystems of their area; processes (natural and artificial selection, sexual and asexual reproduction) and draw conclusions and generalizations based on comparison and analysis; - Analyze and evaluate various hypotheses about the essence, origin of life and man, global environmental problems and their solutions, the consequences of their own activities in the environment; - Find information about biological objects in various sources (textbooks, reference books, popular science publications, computer databases, Internet resources) and evaluate it critically;

1	Name of course	Methods of Mathematical Modeling
2	Code of course	MOMM 3224
3	Cycle of course	BS
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	The Department of Higher Mathematics
7	Year	3
8	Prerequisites	School Course in Mathematics and Geometry, Higher Mathematics
9	Postrequisites	Biometrics in forestry, Meteorology, Statistical analysis and data visualization, Geographic information systems and remote sensing of forests, Information and communication technologies

10	Course summary	Foundations of the theory of errors; numerical methods for solving systems of linear algebraic equations; numerical differentiation; numerical solution of ordinary differential equations; numerical methods for solving boundary value problems for partial differential equations; basic modeling concepts; models described by an autonomous differential equation and systems of autonomous differential equations; living systems and active kinetic media.
11	Learning outcomes	- uses in the practice of scientific research the concepts and methods of mathematical modeling, the study of general and particular methods of mathematical description of natural phenomena; - has practical skills in applying the foundations of the mathematical apparatus for solving theoretical and applied problems, the ability to translate the solution of practical problems into the language of logic. - is able to compare, formulate the setting of tasks, build his own method of solution, prove and substantiate the correctness of his reasoning; - in the field of communication, the formation of personality, the development of intelligence and abilities of logical and algorithmic thinking; - is able to apply methods of mathematical modeling in various branches of natural science, agriculture, forestry and biology, obtaining a systematic fundamental education.

1	Name of course	Physical and chemical research methods
2	Code of course	PACRM 3227
3	Cycle of course	BS
4	Amount of credits	3
5	Level of preparation	Undergraduate studies
6	Department	The Department of Physical Education
7	Year	3
8	Prerequisites	Physics, chemistry, higher mathematics, biology.
9	Postrequisites	Biophysics, Labor protection in forestry, Labor protection and the basics of life safety, Analytical and physical colloid chemistry, Fundamentals of physics
10	Course summary	Separation and concentration methods, Chromatographic methods of analysis, Spectroscopic methods of analysis, Electrochemical methods of analysis, Kinetic, biochemical and biological methods of analysis, Fundamentals of chemometrics and chemical metrology, Analysis of real objects.

11	Learning outcomes	As a result of mastering the course material, the student must competently navigate the main modern methods of separation and concentration used in chemical analysis; represent the meaning and scope of these methods; the main ways to improve them. He must clearly understand what separation and concentration methods are advisable to use for sample preparation and analysis of various objects. The competencies and skills acquired within the course will allow the specialist to skillfully choose the methods of separation and concentration of the components of the analyzed samples in accordance with the task, to assess the feasibility and effectiveness of their use. The student must be able to optimize the methods chosen for the analysis and correctly apply them in practice.
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1	Name of course	Biophysics
2	Code of course	Bio 3228
3	Cycle of course	BS
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	of Physics and Chemistry
7	Year	3
8	Prerequisites	physics, higher mathematics, biology, chemistry.
9	Postrequisites	Fundamentals of Physics, Fundamentals of Thermodynamics and Electromagnetism, Physicochemical Methods of Research, Meteorology, Higher Mathematics *
10	Course summary	Biophysics is a branch of physics, the connection between the micro- and macroworld, the properties of ionizing radiation and the elements of dosimetry. Physical processes in soil and atmosphere. Elements of physics of the atom, atomic nucleus and elementary particles. Elements of quantum electronics. Radioactive radiation and its types. Nuclear reactions and their main types. Elements of elementary particle physics. Dosimetry elements. Biophysics of biological macromolecules. The effect of ionizing radiation on a cell. Types of ionizing radiation. Biophysical bases of the action of ionizing radiation. Dosimetry.
11	Learning outcomes	The ability to use basic knowledge in cognitive and professional activities. Understand the essence and meaning of the information received, correctly interpret the results. The ability to analyze and critically evaluate modern scientific achievements, the use of the basic laws of Biophysics in solving research and practical problems, including in interdisciplinary fields.

1	Name of course	Name of the discipline Biometrics in forestry
2	Code of course	BIF 2229
3	Cycle of course	BS
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Forest resources and forestry
7	Year	2
8	Prerequisites	Dendrology, Forest botany and physiology of woody plants, Forestry and forest resources
9	Postrequisites	Forest nursery business, Forest taxation, Forest management, Forest economy
10	Course summary	Biometrics in forestry-studies the planning of quantities, experiments in forestry and forestry and processing of their results by methods of mathematical statistics., also includes the study of the spatial structure of stands, the analysis of the so-called functions of growth of trees and stands, as well as the use of mathematical modeling methods in forestry and computer-based forestry.
11	Learning outcomes	Know: -based on the class of biometric analyses of forest objects, familiarization with the main directions of random velechin research; - supervision of forest practices and forestry, planning and conducting experiments, mastering the basic approaches of the organization; - the main methodological directions of the study of random variables; - learn to conduct experiments, receive and process digital information. Know: - application of statistical approaches to solving specific problems of special disciplines; - perform analysis of simple statistical models accurately and accurately; - use the results in production and research; The current curriculum includes statistical analysis of digital data on a computer Own: - Analysis of the collected statistical data - full self-realization and decision-making; - development of methods and creation of variations using statistical data; - acquire practical skills to use the normative reference material. draw up documentation on the quality of forest seeds, use GOST

1	Name of course	Amenity planting
2	Code of course	AP 4230
3	Cycle of course	BS
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Forest resources and forestry
7	Year	4
8	Prerequisites	Forest soil science, Forest botany and physiology of woody plants, Dendrology.
9	Postrequisites	the study of urban landscaping allows you to study other special disciplines
10	Course summary	The course is devoted to the study of landscape planning organization of settlements and landscaping objects. The rules of design, principles of structure and spatial organization of objects, composition of plantings, phytocenotic and aesthetic aspects of landscaping are stated. Questions of landscape gardening and economy in the creation of modern landscaping and recreation facilities in cities and towns. Attention is paid to agricultural techniques for creating green spaces, arranging lawns and flower beds, caring for them, protecting and protecting green spaces. History of landscape gardening and modern park construction.
11	Learning outcomes	Know: - rationally include the components of the natural landscape in the landscaping objects (relief, water bodies, vegetation, as well as elements of ethnography, national creativity, engineering structures, architecture of small forms); - competently develop and execute projects of landscaping objects, including landscaping of industrial sites and sanitary protection zones; - select an assortment of trees, shrubs, lianas and herbaceous-flowering plants based on the specifics of landscaping the object and the natural conditions of Kazakhstan; Be able to: - to design, implement, timely and efficiently carry out a complex of works on the care and maintenance of green spaces at the landscaping facility; - apply the rules and regulations for the design of objects, planting composition; technologies for growing planting material; Own: - skills for reproduction and caring for ornamental plants in open and protected ground; - methods of using flower crops in landscaping open spaces. Acquire practical skills: in the design, construction and operation of landscaping facilities in populated areas.

1	Name of course	Meteorology
2	Code of course	Met 2235
3	Cycle of course	BS
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	The Department of Agriculture and Plant Growing
7	Year	2
8	Prerequisites	Physics, geography in secondary school volume
9	Postrequisites	Forest cultures, Forest inventory with the basics of forest inventory, forest nursery, writing a thesis.
10	Course summary	Subject and methods of research in meteorology. Atmospheric pressure. The composition and structure of the atmosphere. Instruments for measuring atmospheric pressure. Solar radiation. Soil and air temperature conditions. Air humidity. Atmospheric precipitation, types and types of precipitation. Soil moisture and its importance for plants. Techniques of soil water regime regulation in the Northern Kazakhstan zone. The wind, its causes and characteristics. Adverse weather events and their importance for agriculture. Air masses. Types of air circulation. Weather forecast. Synoptic map. Local signs of weather. Meteorological observations. Types of meteorological observations and their methods. Meteorological forecasts. Modern methods of meteorological forecasting
11	Learning outcomes	To have an understanding, knowledge and professional skills of meteorological factors and physical processes in the atmosphere affecting forest crops. Knowledge of types of meteorological observations, meteorological instruments. Be able to conduct meteorological observations with the help of meteorological instruments. To master methods of climatic and meteorological characteristics and assessment of growing season conditions of woody and bushy plants. Be able to take into account weather conditions and weather forecasts to adjust the elements of agricultural machinery as a forestry specialist. Possess the methods of forecasting adverse weather events. To know the methods of effective use of climate and microclimate resources in the performance of mechanized works in forestry. Have the skills to organize and conduct fieldwork and management decisions in different weather conditions.

1	Name of course	Forest science and forest resource studies
2	Code of course	FSAFRS 1236
3	Cycle of course	BS
4	Amount of credits	2
5	Level of preparation	Undergraduate studies
6	Department	Forest resources and forestry
7	Year	1
8	Prerequisites	Forest Botany and Physiology of Tree Plants, Dendrology, Ecology and Basics of Life Safety
9	Postrequisites	Forestry with the basics of recreational use, forest use and protection of forests
10	Course summary	Forest science is a scientific discipline about the nature of the forest, its biology and ecology, regularities of dynamics in space and time. It is an integral part of forestry, its natural and historical basis. Forest resource management - identification of accounting and comprehensive assessment of forest vegetation resources. Quantitative and qualitative accounting of all plant organic matter produced by forests, multi-purpose, rational, continuous, sustainable use of forests.
11	Learning outcomes	As a result of the study, the student should know - Morphology and ecology of forest biogeocenoses; regularities of plantation regeneration and formation, change of tree species; - Types of forest resources, their geographical location, ways and opportunities for their rational use. Know how to do it: - to distinguish the main directions in forest typology and principles of classification of forest types; - to make calculations on the economic assessment of forest use; - study components of forest biocoenoses, give forest typological characteristics of forest plantations, determine the composition, structure and productivity of forest plantations. Possess: - methods of forecasting the directions of forest formation processes taking place in forest phytocenoses; - the main methods of determining the indicators of productivity, sustainability and species diversity of forest phytocenoses

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Brief description of elective disciplines of the educational program

Management of foreign trade activities

1	Name of course	Geographic information systems and remote sensing forest
2	Code of course	GSAFRS 4213
3	Cycle of course	BS
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	forest resources and forestry
7	Year	4
8	Prerequisites	Forestry with the basics of recreational use, forest nursery business, Protective afforestation and forest reclamation, Forest crops, Biometrics in forestry, Forest taxation
9	Postrequisites	the course "Geoinformation systems and remote sensing of the forest" is the basis for writing the final work and the formation of professional skills of the bachelor.
10	Course summary	The rational use, conservation and restoration of forests in today's urban world is becoming an increasingly complex and, at the same time, urgent task. Plans, decisions on conservation and sustainable use of forest resources and related businesses are often contradictory and are made in a conflict of interest and with a high degree of uncertainty. ARC/INFO software, the world leader in geographic information systems (GIS), enables forestry professionals to easily integrate and use available sources of tabular and cartographic information to improve decision-making.
11	Learning outcomes	As a result of studying the discipline the student should know: - definition, main components and history of GIS; - basic properties and features of analog maps, map projections; - digital and electronic maps, types of digital terrain models, methods of construction of digital terrain models and their accuracy, the principles of "GPS»; Know: - install and configure specialized GIS, create new projects, form the structure of the map, set the attributes of the display of objects on the screen; - solve problems using digital and mathematical models of the terrain; - analyze the terrain using geographic information systems; - monitor compliance with norms and regulations in the workplace. Possess skills of performance of the basic operations on the analysis of spatial and attributive information, the main software tools of GIS applied in forestry practice, skills of use of satellite navigation systems

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Brief description of elective disciplines of the educational program

Management of small and medium-sized businesses in agriculture

1	Name of course	Engineering geodesy
2	Code of course	IG 2209
3	Cycle of course	BS
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Department of Land Management and Geodesy
7	Year	2
8	Prerequisites	Mathematics, geodesy
9	Postrequisites	Forest inventory, forest Management, geographic Information systems and remote sensing of forests
10	Course summary	coordinate Systems and orientation. Topographic plans and maps. Processing of geodetic measurements and evaluation of the accuracy of the results. Angular measurement. Planned survey justification of engineering and geodetic works. Survey of the area.
11	Learning outcomes	Know: - to create maps for various purposes, terrain plans, as well as digital models of certain areas. - modern software for the development of design and graphic documentation in the field of geodesy; Know: - topographic and geodetic surveys of various sites, sites and trails in order to make plans and profiles; - in field conditions to carry out with use of geodetic devices of measurement, the description of borders and binding on the district of objects of forest and forest Park economy on the district. Own: - measurement of angles and distances on the ground using surveying instruments (theodolites, levels, tapes, tape measures, etc.); computing (laboratory) processing of results of field measurements on a computer; - graphic construction of plans, profiles, digital terrain models (DMM).