TITLE OF THE Curricula/Module

APPLICATION OF GIS TECHNOLOGIES IN AGRICULTURE

NKSU /Kazakhstan

2021

TECH 73101 «Application of GIS technologies in agriculture», 5 credits

Short Name of the University/Country code Date (Month / Year)	The Republic of Kazakhstan Sh.Ualikhanov Kokshetau State University
TITLE OF THE Curricula/Module EP "Agricultural machinery and technology"	TECH 73101

Teacher(s) Doctor PhD Kakabaev N.A., doctoral student Bekbulatov S.K.	Department Department of "Mechanization and Livestock"
Coordinating: Others:	Head of Department: Kakabaev N.A. Dean of the Faculty: Iskakov A.Zh.

Study cycle	Level of the module	Type of the module
BA	Bachelor	Elective

Form of delivery	Duration	Langage(s)
full-time	15 weeks	Russian

Prerequisites	
Prerequisites:	**Co-requisites (if necessary):** Discipline prerequisites: "Fundamentals of precision agriculture", "Technology of crop production"
To know:	Analyze the results of field research and measurements, evaluate their reliability and carry out mathematical processing. Formulate the correct conclusions from the results obtained and give recommendations for their practical application.
Possess:	To carry out field and laboratory studies of the state of individual natural components, natural, natural-anthropogenic and socio-economic complexes. Use global information resources to solve environmental management problems. Analyze and evaluate the collected data, solve problems using the methods of complex system analysis. Draw up reports on research work, prepare scientific reports and articles, messages, abstracts. Own modern telecommunications equipment.

CTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
5	150	45	105

Aim of the module (course unit): competences foreseeen by the study programme
Fundamentals of theoretical and practical skills for researching spatial data with tools of modern geoinformation technologies. The program of the practical part of the course provides for a detailed step-by-step study of specialized software for working in a geographic information system. Methods for regulating the physical state of soils, plant growth and development; The use of various methods for assessing soil physical parameters by methods of use in plant growing with the use of intelligent technologies based on GIS, Earth remote sensing data, Global Navigation Satellite Systems, Web, Big Data, etc.

Learning outcomes of module (course unit)	Teaching/learning methods	Assessment methods
To know: Know the composition and features of the physical and mechanical properties of various soils; satellite observations and remote sensing methods of the earth; required software and work with it; the use of satellite technology in navigation.	Lecture with submission of video materials, practical lesson, SIWT, SIW.	Test control Oral survey Types of control: current, intermediate 1 and 2 control, final control.
To be able to: Use the acquired knowledge and capabilities of satellite receivers; independently determine the coordinates of points using absolute and differential methods; sources of errors in satellite observations and ways to mitigate them		
Have: skills to link the fertility of a particular soil with its physical properties and modes; the method of differentiated fertilization and forecasting the yield of agricultural crops.		

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practiacl work	Laboratory work	Placements	Total contact workобщая	Individual work	Tasks
The structure and development of GIS technologies in agricultural production	2			2			3	7	The importance of structure in the development of GIS technologies in agricultural production
Technical means of ground and space monitoring of lands	2			2			3	7	Factors, conditions and technical means of ground and space monitoring of lands
Methodology for conducting an inventory of arable land using actual data.	2			2			3	7	Methods for determining and assessing the structural state of the soil.
Analysis of the qualitative state of the agricultural land fund, distribution by land categories.	2			2			3	7	Analysis of the particle size distribution in soil formation and soil fertility
Earth remote sensing (ERS) and PA and environmental applications	2			2			3	7	Compilation of soil maps
Image data preprocessing	2			2			3	7	Field contour mapping
Processing the information received	2			2			3	7	Soil condition mapping. Crop yield mapping
Soil sampling technique	2			2			3	7	The concept of absorption capacity and composition of exchange-absorption of different types of soils
Fertilizer demand mapping	2			2			3	7	Mapping agrochemical soil conditions
Crop condition monitoring, identification of local areas of heterogeneity	2			2			3	7	Humification process and formation of humic acids
Creation of electronic maps and databases of surveyed fields	2			2			3	7	Compilation of soil maps
Optical contact and remote methods for quantitative assessment of the nitrogen supply of plants in the implementation of technologies for precise fertilization	2			2			3	7	Factors influencing the agrochemical survey of soils and for creating application

							cartograms of fertilization.
Vegetation observations and diagnostics of the state of agricultural crops	2		2		3	7	Categories and forms of soil moisture. Assessment of plant growth and development in different soil types.
Crop yield map	2		2		3	7	Using these systems, yield cartograms are created, allowing to identify the heterogeneity of the field yield level.
Results of yield forecasting in the precision farming system	2		2		3	7	Forecast of the yield of the main crops and a system for monitoring the state of fields
Total	30		15		45	105	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Running control 1	100	8 week	Oral survey
Running control 2	100	15 week	Oral survey
Final exam	100	16 week	Tickets orally

Compulsory literature/ Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
A. Zh. Akbasov, G. A. Sainova, A. D. Akbasova.	2019	Soil science	**40.3** **A 38** ISBN: 5446874994 ISBN-13(EAN): 9785446874996	Publisher: Academy
Mukha V.D., Kartamyshev N.I.	2003	Agrosoil Science		Publisher: Kolos
A. M. Chandra, S. K. Gosh; tr. from English A. V. Kiryushina.	2008	Remote sensing and geographic information systems		M.: Technosphere
T. A. Trifonova, I. V. Mishchenko, A. N. Krasnoshchekov	2005.	Geographic Information Systems and Remote Sensing in		... - P.: Academ. Project

		Environmental Research		
Yu.F. Knizhnikov	2004.	Aerospace methods of geographical research: a textbook for students. universities.		P.: Academy
Additional literature				
Faizov K.Sh., Urazaliev R.A., Iorgansky A.I.,	2001.	Soils of the Republic of Kazakhstan		Almaty: LLP "Aleiron"
Khabarov A.V.,	2001	"Soil Science with the Basics of Geology".		Moscow
Gerasimova M.I., Gavrilova I.P., Bogdanova M.D .:	2010	Small-scale soil mapping		Publishing house Mosk. un-ty
Truflyak E.V.	2016	The main elements of a precision agriculture system	631.171 (076.5)	Krasnodar KubSAU
Dr. *Jitka* Kumhálová / Prof. Kumhála František	2019	Soil physical properties and its measurement		Presentations

ANOTATION /course summery

The discipline "Application of GIS technologies in agriculture" studies information about the most important physical properties of soil and its relationship, technical means of ground and space monitoring of lands, remote sensing of the earth, processing the information received, mapping the need for fertilization, monitoring the state of crops, creating electronic maps and databases of surveyed fields, vegetation observations and diagnostics of the state of crops, a map of crop yields using GIS technologies.

List of themes and short description

Themes	Contact work hours
The structure and development of GIS technologies in agricultural production	**10**
Technical means of ground and space monitoring of lands	**10**
Methodology for conducting an inventory of arable land using actual data.	**10**
Analysis of the qualitative state of the agricultural land fund, distribution by land categories.	**10**
Earth remote sensing (ERS) and PA and environmental applications	**10**
Image data preprocessing	**10**
Processing the information received	**10**
Soil sampling technique	**10**
Fertilizer demand mapping	**10**
Crop condition monitoring, identification of local areas of heterogeneity	**10**
Creation of electronic maps and databases of surveyed fields	**10**

Optical contact and remote methods for quantitative assessment of the nitrogen supply of plants in the implementation of technologies for precise fertilization	**10**
Vegetation observations and diagnostics of the state of crops	**10**
Crop yield map	**10**
Results of yield forecasting in the precision farming system	**10**
Total	**150**