

Study program: Geoinformation Technologies

Qualification: PhD

General Information			
University	Armenian National Agrarian University (ANAU)		
Course title	Precision agriculture		
The responsible lecturer	Professor Gurgen Yeghiazaryan Associate Professor Artak Zaqaryan Email: sfwmrc@yahoo.com , yeghiazaryangurgen@gmail.com artak_zakaryan@mail.r		
Course type	Elective		
Course Goal	The goal of the course is to increase crop yields, improve soil conditions, and reduce economic costs to a minimum through the use of the latest methods and technologies.		
Prerequisites and co-requisites (if applicable):	Sensors, RS, GIS, satellite image decoding, spatial database		
Duration and ECTS Credits	In credits (ECTS)	In hours	Semester
	5	150 (84 auditorium + 66 individual)	Fall
Learning Outcomes	After completing this course, the students should be able to: <ul style="list-style-type: none">• Demonstrate skills and knowledge of the latest methods and technologies• Create a spatial database, analyze and evaluate them in the GIS environment• Master the methods of remote sensing and apply them to the decoding and processing of drone images and drone footage.• Possess the digital tools working with satellite global positioning system and apply them in the management of agricultural problems• Compile electronic maps and 3D models for the accurate solution of agricultural problems		

Syllabus (List of lessons)	Module 1	The content, purpose and problems of precision agriculture
		<ul style="list-style-type: none"> • The need, purpose and problems of precision agriculture • Precision agriculture tools and technologies
	Module 2	Digital equipment used in precision agriculture
		<ul style="list-style-type: none"> • Tachometers, GNSS, optical level • Laser, optical levels • Drones • Artificial satellites
	Assignment #1	Each student will submit a report on the goals, problems, performance and application of digital tools and equipment in precision agriculture
	Module 3	The working principles of the precision farming system
		<ul style="list-style-type: none"> • Multi-factor accurate mapping • Selection of satellite images, download • Processing of satellite images using the remote sensing method
	Assignment #2	Present the results of remote sensing electronic mapping related to the research topic
	Module 4	Lands monitoring and calculation of NDVI index
		<ul style="list-style-type: none"> • Creation of electronic maps of land plots • Calculation of vegetation indices • Land monitoring • Yield prediction
	Assignment #3	Within the framework of the research topic, present an electronic map of the plot, calculate the vegetation index and forecast the yield
	Module 5	Classification of satellite images, field work, decoding, accuracy
		<ul style="list-style-type: none"> • Spatial, spectral, radiometric resolution • Organization and implementation of field work • Classification, decoding, accuracy determination
	Assignment #4	Submit a report within the framework of individual topics with the content of classification, decoding and accuracy assessment of satellite images

Short description	<p>Description of the latest methods and technologies</p> <p>GIS environment and spatial database</p> <p>RS technologies and their application in agriculture</p> <p>Management of satellite, global positioning and databases</p> <p>Electronic land mapping, construction of 3D models</p>
Recommended textbooks and links (in order of relevance):	<p>Required text and materials</p> <p>1. Константинов М. М., Ловчиков А. П., Завражнов А. И. Практикум по точному земледелию. Лань, 2015, ISBN: 978-5-8114-1843-5, с. 224</p> <p>2. В. И. Балабанов, А. И. Беленков, Е. В. Березовский, В. В. Егоров, С. В. Железова. Навигационные технологии в сельском хозяйстве. Координатное земледелие. Учебное пособие для высших учебных заведений</p> <p>3. Практикум по точному земледелию Учебное пособие" Авторы: Под редакцией д. т. н. М.М. Константинова Год издания: 2015.</p> <p>4. Agric Rubaiya Binte Mostafiz, Ryozo Noguchi and Tofael Ahamed Agricultural Land Suitability Assessment Using Satellite Remote Sensing-Derived Soil-Vegetation Indices</p> <p>5. Asseng, S., Foster, I., Turner, N.C., 2011. The impact of temperature variability on wheat yields. <i>Global Change Biology</i> 17, 997–1012. https://doi.org/10.1111/j.1365-2486.2010.02262.x</p> <p>6. Barlow, K.M., Christy, B.P., O’Leary, G.J., Riffkin, P.A., Nuttall, J.G., 2015. Simulating the impact of extreme heat and frost events on wheat crop production: A review. <i>Field Crops Research</i> 171, 109–119. https://doi.org/10.1016/j.fcr.2014.11.0107.</p> <p>7. Prepared by Dr. Chang-Gil Kim Korea Rural Economic Institute, The Impact of Climate Change on the Agricultural Sector: Implications of the Agro-Industry for Low Carbon, Green Growth Strategy and Roadmap for the East Asian Region https://www.unescap.org/sites/default/files/5.%20The-Impact-of-Climate-Change-on-the-Agricultural-Sector.pdf</p> <p>8. Marshet Nigatu Gebeyehu* Jimma University, Ethiopia Submission: April 11, 2019; Published: May 10, 2019, Remote Sensing and GIS Application in Agriculture and Natural Resource Management</p>

	<p>https://juniperpublishers.com/ijesnr/pdf/IJESNR.MS.ID.556009.pdf</p> <p>9. Satellite Remote Sensing and GIS based Crops Forecasting & Estimation System in Pakistan. Ijaz Ahmad*, Abdul Ghafoor, Muhammad Iftikhar Bhatti ,Ibrar-ul Hassan Akhtar, Muhammad Ibrahim, Obaid-ur-Rehman</p> <p>https://www.fao.org/fileadmin/templates/rap/files/Project/Expert Meeting_17Feb2014_/P2-2_Satellite Remote Sensing and GIS based Crops Forecasting Estimation System in Pakistan.pdf</p> <p>10. Precision Agriculture: Technology To Boost Crop Farming. Published in 20.04.2022 Earth Observing System</p> <p>https://eos.com/blog/precision-agriculture/</p> <p>11. Using remotely sensed data and GIS to improve farm planning and productivity, Darryl Woodrow http://www.regional.org.au/au/gia/08/259woodrow.htm</p>
<p>Assessment methods and criteria</p>	<p>Final exam with 20-point grade.</p> <p>To successfully complete this course, students must achieve a passing grade of 50% or higher on the overall course and on the mandatory final project. Under final project students should develop a research proposal.</p>