

<b>Description of individual educational component (module)</b>	
<b>Modern problems in Agroengineering</b>	
Agromechatronics	
CU4	
Organisation	Astrakhan State University
Faculty	Faculty of Agribusiness and Veterinary Medicine
Department	Department of Agriculture
Responsible person	Dr.Valerii Rudenko
Type of course unit	compulsory
Level of course unit	second cycle
Year of study (if applicable), semester/trimester when the individual educational component is delivered	1 <sup>st</sup> , 2 <sup>nd</sup> semester
Number of ECTS credits allocated	8
Total hours	288
Contact hours	84
Self-study hours	204
Maximum attendance	20
Name of lecturer(s)	Dr.Valerii Rudenko
Prerequisites and corequisites	basic knowledge in mathematics, physics, mechanics, engineering
Course contents	The role of agriculture in the world economy. The structure of the agro-industrial complex Engineering and technical support of agricultural production Principles of technological modernization of agricultural production Information technology, automation of mobile technology.
Recommended or required reading and other learning resources/tools	Modern problems of science and production in agroengineering / A.I. Zavrzhnova. - Publishing house "Lan", 2013. – 496p. Chernoyivanov V.I. World tendencies of machine-technological provision of intellectual agriculture: scientific. ed. / Chernoyivanov VI, Ezhevsky AA, Fedorenko VF. - Moscow: FGBNU "Rosinformagrotekh", 2012. - 284p.
Language of instruction	Russian

<b>Learning outcomes of the course unit</b>
LO1: Search, process and analyze information from various sources LO2: Identify and analyze problem situations and new trends in Agroengineering and Robotics. LO3: Offer solutions to problems in the field of agro engineering and robotics.

<b>Planned learning activities and teaching methods</b>
lectures, presentation, seminars

<b>Assessment methods and criteria</b>
LO1, LO2, LO3 – individual written work (essay)

<b>Mapping Programme Key Learning Outcomes to Module Learning Outcomes</b>
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<b>Programme Key Learning Outcomes</b>	<b>Module Learning Outcomes</b>
<p>LO1: Search, process and analyze information from various sources</p> <p>LO2: Identify and analyze problem situations and new trends in agro-engineering and robotics.</p> <p>LO3: Offer solutions to problems in the field of agro engineering and robotics.</p>	<p>On successful completion of this module students should be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate in-depth knowledge and understanding of research methodology in modern technological processes and systems of agro-industrial complex</li> <li>2. Analyze new and complex scientific problems within the context of mechatronics application in agricultural production</li> <li>3. Outline technological modernization principles and management strategies for technological processes in agricultural production</li> <li>4. Apply innovative information technologies to the search and evaluation of the modern and promising technological processes and systems</li> <li>5. Define the direction of modernization of agricultural production and the principles of management of technological processes</li> </ol>

<b>Assessment criteria table</b>				
<b>Attribute</b>	<b>Excellent (90 – 100 points)</b>	<b>Good (70 - 90 points)</b>	<b>Satisfactory (60 - 70 points)</b>	<b>Unsatisfactory (0-59 points)</b>
<b>Content (70%)</b>	Search, processing and analysis of information performed at a high level, suggested ways to solve problems	Search, processing and analysis of information is performed at a good level, there are some shortcomings, suggested ways to solve problems	Search, processing and analysis of information is made with flaws, there are no ways to solve problems	The content of the work does not correspond to the topic in question.
<b>Sources of information used (20%)</b>	All types and key sources of information are used.	All types are used, several key sources of information are missing.	Not enough types and key sources of information are used.	-
<b>The style of presentation and design (10%)</b>	Excellent style of presentation and design	Good writing style and design.	There are shortcomings in the style of presentation and design.	-

<b>Description of individual educational component (module)</b>	
<b>Digital Technologies in the Agroindustrial Complex</b>	
Agromechatronics	
CU5	
Organisation	Astrakhan State University
Faculty	Faculty of Physics and Technology
Department	Department of Agriculture
Responsible person	Dr.Ravil Arykbaev
Type of course unit	compulsory
Level of course unit	second cycle
Year of study (if applicable), semester/trimester when the individual educational component is delivered	2 <sup>nd</sup> semester
Number of ECTS credits allocated	3
Total hours	108
Contact hours	24
Self-study hours	84
Maximum attendance	20
Name of lecturer(s)	Dr.Alexandr Koshkarov
Prerequisites and co requisites	basic knowledge in mathematics, physics, informatics, agriculture
Course contents	The role of information technology in the production of agricultural products. Informational resources Precision agriculture system Technical means and ways of data processing and reflection. Principles of construction and functionality of parallel and automatic movement of technical means.
Recommended or required reading and other learning resources/tools	Varlamov, A.A. Geographical and land information systems [Text] / AA Varlamov, SA Galchenko. - Moscow: Colossus, 2006. - 400 p. Adadimova L. Y. Geoinformation technologies of territorial organization of Volga region agriculture: scientific publication [Text] / L. Y. Adadimova; State Scientific Establishment of the Agricultural Research Institute of the Agricultural Academy of the Russian Academy of Agricultural Sciences. - Saratov: Saratov Spring, 2012. - 228p.
Language of instruction	English

<b>Learning outcomes of the course unit</b>
LO2: Identify and analyze problem situations and new trends in Agroengineering and Robotics.

<b>Planned learning activities and teaching methods</b>
lectures, presentation, seminars

<b>Assessment methods and criteria</b>
LO2 - Exam

<b>Mapping Programme Key Learning Outcomes to Module Learning Outcomes</b>	
<b>Programme Key Learning Outcomes</b>	<b>Module Learning Outcomes</b>
LO2: Identify and analyze problem situations and new trends in Agricultural Engineering and Robotics.	<p>On successful completion of this module students should be able to:</p> <ol style="list-style-type: none"> <li>1. Name and describe methods of obtaining and processing spatially-bound data.</li> <li>2. Use modern information technologies to increase the performance of the use of technical systems.</li> <li>3. Apply methods of obtaining and processing spatially-bound data.</li> <li>4. Use hardware and software systems for the collection, processing and presentation of data.</li> <li>5. Demonstrate advanced skills in using of information systems and technologies for the implementation of complex technological processes.</li> </ol>

<b>Assessment criteria table</b>				
<b>Attribute</b>	<b>Excellent (90 - 100 points)</b>	<b>Good (70 – 90 points)</b>	<b>Satisfactory (60 -70 points)</b>	<b>Unsatisfactory (0-59 points)</b>
<b>Exam - written part (70%)</b>	Demonstrates profound knowledge of theoretical material and the ability to apply it	Demonstrates good knowledge of theoretical material and the ability to apply it; single errors are possible	Incomplete knowledge of theoretical material, requiring leading questions from the teacher, difficulties in its application	Lack of knowledge of theoretical material and the ability to apply it
<b>Exam – oral part (30%)</b>	The ability to reasonably express their thoughts, draw the necessary conclusions	The ability to express their thoughts, to draw the necessary conclusions.	Difficulties in presenting your thoughts and formulating conclusions.	-

<b>Description of individual educational component (module)</b>	
<b>Mechatronics and Robotics</b>	
Agromechatronics	
CU6	
Organisation	Astrakhan State University
Faculty	Faculty of Physics and Technology
Department	Department of Electrical Engineering, Electronics and Automatics
Responsible person	Dr.Alexey Rybakov
Type of course unit	compulsory
Level of course unit	second cycle
Year of study (if applicable), semester/trimester when the individual educational component is delivered	1 <sup>st</sup> semester
Number of ECTS credits allocated	4
Total hours	144
Contact hours	36
Self-study hours	108
Maximum attendance	20
Name of lecturer(s)	Dr.Alexey Rybakov
Prerequisites and corequisites	basic knowledge in Mathematics, Physics, Mechanics, Engineering, Electrical engineering, Electronics
Course contents	Properties of biological objects in agricultural production. Features of the interaction of biological and technical systems. Conditions for the functioning of robotic systems in agricultural production. Arrangements and technical characteristics of agricultural robots. Features of the development of robotic systems for the agro-industrial complex.
Recommended or required reading and other learning resources/tools	Yurevich E.I. Fundamentals of robotics: training. - 3rd ed., Pererab. and additional. - St. Petersburg, 2010. - 368 p. Aniskin V.I. Prospects of technical support of agriculture // Mechanization and electrification of agriculture. №12 1999 Gerasun VM, Nesmiyanov IA Control systems of manipulators based on spatial actuators // Mechatronics, automation, control. Moskov. 2010.
Language of instruction	English

<b>Learning outcomes of the course unit</b>
LO5: Apply calculation and design methods to solve problems associated with robotized and mechatronic systems.

<b>Planned learning activities and teaching methods</b>
lectures, seminars, practical classes, individual work

<b>Assessment methods and criteria</b>
LO5- finding solution to the design problem , Exam

Mapping Programme Key Learning Outcomes to Module Learning Outcomes	
Programme Key Learning Outcomes	Module Learning Outcomes
LO5: Apply calculation and design methods to solve problems associated with robotized and mechatronic systems	<p>On successful completion of this module students should be able to:</p> <ol style="list-style-type: none"> <li>1. Classify (describe) existing robotic systems and define perspective development directions of agricultural robots.</li> <li>2. Explain possible interactions of biological and technical systems in agricultural production.</li> <li>3. Demonstrate adequate knowledge of conditions and modes of mechatronic and robotic systems operation.</li> </ol>

Assessment criteria table				
Attribute	Excellent (90...100 points)	Good (70...90 points)	Satisfactory (60...70 points)	Unsatisfactory (0...59 points)
<b>Решение задачи (50%)</b>	The problem is solved completely, there are no errors in the calculations.	The problem is solved completely, there are errors in the calculations	The problem is partially solved	The problem isn't solved.
<b>Exam - written part (40%)</b>	Demonstrates profound knowledge of theoretical material and the ability to apply it	Demonstrates good knowledge of theoretical material and the ability to apply it; single errors are possible	Incomplete knowledge of theoretical material, difficulties in its application	Lack of knowledge of theoretical material and the ability to apply it
<b>Exam – oral part (10%)</b>	The ability to reasonably express their thoughts, draw the necessary conclusions	The ability to express their thoughts, to draw the necessary conclusions.	Difficulties in presenting your thoughts and formulating conclusions	-

<b>Description of individual educational component (module)</b>	
<b>Designing of Robotic Systems in the Agroindustrial Complex</b>	
Agromechatronics	
CU16	
Organisation	Astrakhan State University
Faculty	Faculty of Physics and Technology
Department	Department of Electrical Engineering, Electronics and Automatics
Responsible person	Dr.Alexey Rybakov
Type of course unit	compulsory
Level of course unit	second cycle
Year of study (if applicable), semester/trimester when the individual educational component is delivered	3st and 4 <sup>th</sup> semester
Number of ECTS credits allocated	5
Total hours	180
Contact hours	34
Self-study hours	146
Maximum attendance	20
Name of lecturer(s)	Dr.Alexey Rybakov
Prerequisites and corequisites	basic knowledge in Mathematics, Physics, Mechanics, Engineering, Electrical Engineering, Agriculture
Course contents	Features of production processes using robotic systems. Operational properties of robotic systems. Operational costs. Diagnosis of robotic systems. Methods and means of control and diagnostics. Features and rules for safe operation of robotic systems.
Recommended or required reading and other learning resources/tools	Reliability and efficiency in Engineering. A reference book in 10 volumes. - M.: Mechanical Engineering, - 1986. Yashchura AI System of maintenance and repair of common industrial equipment: Handbook. - Moscow: Izdatelstvo NTs ENAS, 2006. - 360 p.
Language of instruction	Russian

<b>Learning outcomes of the course unit</b>
LO5: Apply calculation and design methods to solve problems associated with robotized and mechatronic systems.
LO7: Manage a project at all stages of its life cycle.

<b>Planned learning activities and teaching methods</b>
lectures, seminars, practical classes, individual work, group work, carry out project

<b>Assessment methods and criteria</b>
LO5, LO7 - project

<b>Mapping Programme Key Learning Outcomes to Module Learning Outcomes</b>	
<b>Programme Key Learning Outcomes</b>	<b>Module Learning Outcomes</b>
LO5: Apply calculation and design methods to solve problems associated with robotized and mechatronic systems. LO7: Manage a project at all stages of its life cycle.	On successful completion of this module students should be able to: <ol style="list-style-type: none"> <li>1. Formulate the requirement specifications influencing the choice of structure, design and parameters of elements of robots for the agro-industrial complex.</li> <li>2. Synthesize complex agro-industrial robotic and mechatronic systems with the following analysis and improvement of their characteristics</li> </ol>

<b>Assessment criteria table</b>				
<b>Attribute</b>	<b>Excellent (90...100 points)</b>	<b>Good (70...90 points)</b>	<b>Satisfactory (60...70 points)</b>	<b>Unsatisfactory (0...59 points)</b>
<b>Project implementation (60%)</b>	The project is implemented at a high level.	The project is executed at a good level.	The project is partially done.	The project isn't done.
<b>The style of presentation and design (10%)</b>	Excellent style of presentation and design	Good writing style and design.	Disadvantages in the style of presentation and design	Errors in the style of presentation and design
<b>Report quality (10%)</b>	The style and clarity of the report was excellent.	The style and/or clarity of the report were very good.	The style and/or clarity of the report were good.	The style and/or clarity of the report fell short of a passing grade.
<b>Period of completion (20%)</b>	Project completed on time	Project completed on time	The project was completed with a delay	The project isn't completed