

Short Name of the University/Country code Date (Month/Year)	AUP/4000 2020
TITLE OF THE Curricula/Module	Code
BASICS OF THE PRECISION AGRICULTURE – CHARACTERISTICS, TECHNOLOGIES, ECONOMIC EFFICIENCY, OPTIMAL USE OF RESOURCES	

Teacher(s)	Department
Coordinating: Assoc. Prof. Dimo ATANASOV PhD Others: Dobri DUNCHEV	Economics

Study cycle	Level of the module	Type of the module
	Bachelor Master	

Form of delivery	Duration	Langage(s)
In class presentations and discussions Practical training	15 weeks	English Bulgarian

Prerequisites	
Prerequisites: <u>To know:</u> Basic economic theories and methodologies Basics of natural resources and ecosystems services Specifics of agricultural production systems Basics of agricultural machinery Basics of informatics and information technologies <u>To be able to:</u> Use mathematical and statistical methods of calculation and analyses Understand and speak English or Bulgarian	Co-requisites (if necessary):

ECTS (Credits of the module)	Total student workload hours	Contact hours	Praxis	Individual work hours
5	154	72	40	42

Aim of the module (course unit): competences foreseen by the study program

This course provides an introduction to Precision Agriculture – characteristics, technologies and practices. The main focus is on the economic efficiency of different technologies, used in precision farming, as well as on the overall economic performance of agricultural production systems, applying precision farming practices.

Through lectures, seminars and practical demonstrations this course presents the concept, the most popular technologies and the most influential factors for precision farming. Economic theories and methodologies for evaluation and assessment of efficiency and profitability of precision farming practices are discussed and analyzed.

Learning outcomes of module (course unit)	Teaching/learning methods	Assessment methods
<p>Understand sustainable development /economic, social and environmental aspects/.</p> <p>Understand possibilities for economic development and the conflict between unlimited humane desires and the limited natural resources.</p> <p>Define precision agriculture /managerial, technological and social perspectives/.</p> <p>Understand the spatial and temporal variability.</p> <p>Explain the overall concept of precision agriculture.</p> <p>Understand the main technologies in precision farming /GIS, GSNS, Soil sampling, Field mapping, Remote sensing, Yield monitoring, VRT, etc./.</p> <p>Knowledge on estimation of costs and benefits and assessment of efficiency and profitability of precision farming technologies.</p> <p>Generate a vision for precision agriculture in the future</p>	<p>Lectures, presentations, seminars, practical lessons, self-study</p>	<p>Participation in discussions,</p> <p>Course project development,</p> <p>Written test</p> <p>Verbal exam</p>

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
PART 1 ECONOMIC DEVELOPMENT AND NATURAL RESOURCES	11	1		11			23	13	
Economic growth and social development. Models of economic growth.	2			2			4	2	
Specifics of agricultural production systems. Conventional, Organic, Biodynamic.	2			2			4	3	
Nature, classification and main characteristics of production resources in agriculture /natural, humane, capital/.	3			3			6	3	
External effects from natural resource exploitation. Internalization of external effects.	2			2			4	2	
Sustainable agriculture.	2	1		2			5	3	
PART 2 PRECISION AGRICULTURE	12	3		12			27	17	
Spatial and temporal variability of soil nutrients and crop yields. Variability among animal yields.	2			2			4	3	
Introduction to precision agriculture – concept, definitions, historic development, economic and environmental benefits, criticism.	2	1		2			5	4	
New technologies and innovations. Adoption of new technologies and innovations in agriculture. GIS, GSNS, Soil sampling, Field mapping, Remote sensing, Yield monitoring, VRT, etc.	3	1		4			8	5	
Efficiency and profitability of technologies and production	4	1		4			9	5	

systems. • Technical efficiency – crop yield per unit of land, animal yield, inputs optimization, time saving, environmental impact, etc. • Economic efficiency – revenue, costs, profits, etc.									
Case studies presentation	1						1		
PART 3 THE FUTURE OF PRECISION AGRICULTURE	7	1	7	7			22	12	
Investing in precision farming. Investment projects development and evaluation.	3	1		3			7	3	
International and national policies for sustainable and precision agriculture.	1			2			3	3	
Education for innovation and implementation of precision farming	2			2			4	2	
Case studies presentation	1						1		
Round table/Seminar for discussions and updating of information			7				7	4	
TOTAL	30	5	7	30			72	42	

The students are expected to undertake other 40 hours of praxis.

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Running control Part 1	15	4 week	Participation in discussions.
Running control Part 2	25	10 week	Participation in discussions. Solving of cases and tasks.
Running control Part 3	25	15 week	Course project development.
Final exam	35		Final test and quiz.

Compulsory literature/Author	Year ofiss	Title	No of periodical	Place of printing. Printing house or
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	ue		or volume	internet link
Atanasov, Dimo	2019	Basics of the Precision agriculture – characteristics, technologies, economic efficiency, optimal use of resources	Lectures Presentations	Electronic version
David Schimmelpfennig	2016	Farm Profits and Adoption of Precision Agriculture		U.S. Department of Agriculture, Economic Research Service
Joint Research Centre (JRC) of the European Commission	2014	PRECISION AGRICULTURE: AN OPPORTUNITY FOR EU FARMERS - POTENTIAL SUPPORT WITH THE CAP 2014-2020		http://ict-agri.eu/sites/ict-agri.eu/files/IPOL-AGRI_NT%282014%29529049_EN.pdf
Additional literature				
Mihalis Kritikos	2017	Precision agriculture in Europe: Legal, social and ethical considerations		© European Union, 2017. PE 603.207 ISBN 978-92-846-1662-6 doi: 10.2861/278 QA-06-17-010-EN-N
https://ec.europa.eu/eip/agriculture/en/digitising-agriculture/developing-digital-technologies/precision-farming-0 http://www.fao.org/e-agriculture/news/developing-digital-agriculture-strategy-europe-and-central-asia-fostering-digital-agriculture https://smartagrihubs.eu/latest/news/2019/August/DD3Declarationonagricultureandruralareas-signedpdf-%281%29.pdf https://events.euractiv.com/event/info/digital-farming-driving-productivity-and-a-more-sustainable-way-of-farming https://www.nik-agroservice.com/en/ https://agfundernews.com/what-is-precision-agriculture.html				

ANOTATION /course summery

Precision agriculture or precision farming is a new approach to sustainable development, combining scientific knowledge, agronomic experience, mechanical engineering, computer and spatial technologies, optimizing production practices to perfection.

This course provides an introduction to Precision Agriculture – characteristics, technologies and practices. The main focus is on the economic efficiency of different technologies, used in precision farming, as well as on the overall economic performance of agricultural production systems, applying precision farming practices.

Through lectures, seminars and practical demonstrations this course presents the concept, the most popular technologies and the most influential factors for precision farming. Economic theories and methodologies for evaluation and assessment of efficiency and profitability of precision farming practices are discussed and analyzed.

List of themes and short description

Themes	Contact work hours
Economic growth and social development. Models of economic growth.	4
Specifics of agricultural production systems. Conventional, Organic, Biodynamic.	4
Nature, classification and main characteristics of production resources in agriculture /natural, humane, capital/.	6
External effects from natural resource exploitation. Internalization of external effects.	4
Sustainable agriculture.	5
Spatial and temporal variability of soil nutrients and crop yields. Variability among animal yields.	4
Introduction to precision agriculture – concept, definitions, historic development, economic and environmental benefits, criticism.	5
New technologies and innovations. Adoption of new technologies and innovations in agriculture. GIS, GSNS, Soil sampling, Field mapping, Remote sensing, Yield monitoring, VRT, etc.	8
Efficiency and profitability of technologies and production systems. <ul style="list-style-type: none"> • Technical efficiency – crop yield per unit of land, animal yield, inputs optimization, time saving, environmental impact, etc. • Economic efficiency – revenue, costs, profits, etc. 	9

Case studies presentation	1
Investing in precision farming. Investment projects development and evaluation.	7
International and national policies for sustainable and precision agriculture.	3
Education for innovation and implementation of precision farming	4
Case studies presentation	1
Round table/Seminar for discussions and updating of information	7