

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRARIAN UNIVERSITY**

Plant growing Department

"APPROVED"

**Head of the Plant growing
Department**

**" _____ " _____ 2019
_____ Trotsenko V.I.**

EDUCATIONAL - PROFESSIONAL PROGRAM

MODERN WORLD AGROTECHNOLOGIES

(code and academic discipline name)

Specialty 201 «Agronomy»

(code and specialty name)

2019 – 2020 academic year

The project team consists of:

D.Sc., Professor Trotsenko V. I. (_____)

D.Sc., Professor Zhatov O. G. (_____)

Educational - Professional Program is approved at the meeting of Plant Growing Department

« _____ » _____ 2019
(Minutes No.)

**Head of Plant Growing
Department**

_____ (V. I. Trotsenko)
(signature) (surname and initials)

Approved:

Dean of the faculty of Agrotechnology
and Environmental Use

_____ I. M. Kovalenko

Methodist of educational department

_____ G. O. Baboshyna

Registered in electronic database: date:

_____ 2019

1. Description of the course

Indicators Knowledge area	Area of knowledge, direction of preparation, educational degree	Characteristics of the discipline
		full-time study
Number of credits – 4	Knowledge area: 20 Natural Sciences and food	Normative
Modules - 2	Specialty: 201 «Agronomy»	Year of preparation:
Content modules –2		2019-2020
Individual research assignment:		Course
		1
		Semester
Total hours - 120		2
	Educational degree: Doctor of Philosophy	Lectures - 44 hours
		Practical classes - 44 hours
		Consultations - 16 hours
		Individual work - 16 hours
		Type of control: credit

2. The purpose and objectives of the discipline

Purpose: To form students' understanding that each specific agrotechnology is a holistic, clearly defined and scientifically grounded system with a complex of irreplaceable, interrelated elements, each of which performs a specific function, and all together - a function of the system, whose essence is to develop the intended volume and quality of plant products.

Objective: To evaluate the potential of modern varieties and hybrids, soil and climatic resources of a particular zone and economy. To carry out the analysis of the status of groups of harmful organisms, to substantiate and choose the system of measures to regulate them taking into account the soil-climatic conditions and economic and financial opportunities.

As a result of studying the discipline, the student must:

know:

Module 1: the latest world and European trends in the formation of modern world agrotechnologies for growing cereals, legumes and cereals. Influence of the basic natural and agro-technical factors on the technological processes in the cultivation of these crops.

Module 2: Achievements of intensive type of agrotechnology in the cultivation of industrial crops, as well as their application and modern technical support for different soil and climatic zones of Ukraine.

be able to:

Module 1: assess the potential of modern varieties and hybrids, soil and climate resources of a particular area and farm; to analyze the status of groups of harmful organisms (weeds, pests and diseases), to justify and choose a system of measures to regulate them taking into account the soil-climatic conditions and economic and financial opportunities; to make agrotechnical part of technological maps for growing cereals, legumes and cereals and scientifically and reasonably program their maximum yields in the economy.

Module 2: to evaluate the labor, technical, energy and other material resources of the economy and use them rationally; to make agrotechnical part of technological maps for cultivation of industrial crops and to and develop scientifically and implement measures to improve the size and quality of the crop; to substantiate scientifically the feasibility of a technological event or their system that has been implemented and has had a positive effect in other countries of the world; to plan the execution of individual technological processes in time and space; carry out a comprehensive analysis of the condition of the agricultural object and use it effectively; to have modern methods of analyzing the condition and development of the both separate objects and plant growing industry.

The general competencies that the aspirant must have

Code	General competencies
ZK1	Ability to learn, master modern knowledge, self-improve and form a systematic scientific outlook
ZK 2	Ability to critical analyzing and evaluating of modern scientific achievements, synthesis of knowledge, complex problem solving
ZK 3	Ability to abstract creative thinking, identification, receiving, systematizing, synthesize and analyze of information from various sources using modern information technologies in scientific activity.
ZK 5	Ability to generate new ideas and make informed decisions to achieve goals.
ZK 8	Ability to take initiative, take responsibility, motivate people and move toward a common goal.
ZK 11	The ability to prepare scientific texts, to present, discuss, debate scientific results in their scientific work in national and foreign languages, to an extent sufficient for full understanding, demonstrating a culture of scientific oral and written language.

Expected learning results of the discipline

Code	Program Results
PRN 1	Possess advanced modern conceptual and methodological knowledge when performing research and / or professional activities and at the border of subject areas of knowledge
PRN 10	To conduct professional interpretation of received materials on the basis of modern software using existing theoretical models, to create own object-theories
PRN 13	To present professionally the results of research at national and international scientific conferences, seminars, use foreign language in scientific, educational and innovative activities
PRN 16	Organize research in accordance with the requirements of safety and health.
PRN 18	Be responsible for the novelty of research and expert decision making, motivating employees and moving toward a common goal.
PRN 20	To formulate a scientific problem with regard to the values of modern society and the state of its scientific development, working hypotheses of

	the problem under study, which should extend and deepen the state of scientific research in the field of Agronomy
PRN 21	To present research results in the form of a dissertation, to defend the results of a dissertation research

Corelation the results of the discipline with the program results

Competencies	PRN 1	PRN 10	PRN 13	PRN 16	PRN 18	PRN 20	PRN 21
SK 3	*	*	*	*			
SK 4		*	*	*	*		
SK 5	*		*		*		*
SK 7		*	*		*	*	
SK 8	*		*	*	*	*	
SK 11	*		*		*	*	*

SK 3. Ability to have information on the current state and tendencies of development of world and national agrotechnologies of crops cultivation.

SK 4. Ability to formalize professional applied problems in the field of agro-industrial testing, to algorithmize them.

SK 5. The ability to establish the natural prerequisites for the application of specific modifications and methods of research, the choice of rational methods of field and laboratory work and the assessment of the required accuracy of measurements and quality of the final constructions, which must be confirmed by the example of own research.

SK 7. Ability to analyze, systematize and summarize the results of experiments and research; to draw conclusions from the obtained research, to apply them in the scientific and practical sphere.

SK 8. Ability to process the obtained experimental data, to establish analytical and statistical relationships between them and the studied parameters based on the use of standard mathematical packages of information processing.

SK 11. Ability to participate in critical dialogue, scientific discussions at the international level, to defend their own position, to entrepreneurship and to take initiative in implementing the results of the dissertation research.

The discipline program

- **MODULE 1. Scientific bases of world agrotechnologies for cultivation of field crops and their biotic potential.**

Content module 1. Natural abiotic potential

Topic 1. Scientific bases of modern agrotechnologies.

History and stages of development of modern agro-technologies: morphological, analytical, agrotechnical and integral (agrotechnological). Methodology, theory and practice of modern agrotechnologies. Composition, structure (interrelation of components) and functions (laws of interrelation, mechanism of action of components) of agricultural technologies.

Ecological, social, technical, economic and other foundations and functions of modern agro-technologies.

The most important criteria for the integrity of agricultural technologies:

- polar organization;
- dynamics of elements and agricultural technologies in general;
- processes of polarization of metabolism;
- the degree of formation of a substance or an active function at the boundary or the transition between two parts of agro-technology.

Topic 2. Natural abiotic potential of agrotechnologies and its rational use.

Abiotic potential of agro-technologies: land, soil and climate resources as a whole system and part of agro-technologies. Energy and material relations between the elements of the abiotic part and the laws of formation of the abiotic potential of agricultural technologies.

Land resources and their rational use. Methodology, theory and world practice of agricultural land formation. Relationship between individual types of agricultural land and their laws. Influence of land structure on the formation and stability of

their abiotic environment, productivity of crops, efficiency of agricultural technologies.

Soil resources and their use. Methodology, theory and world practice of formation and use of soil potential as an element of abiotic system and part of agrotechnology depending on geography, orography and hydrology. Influence of agrotechnologies in general and their components on the formation and use of soil potential. Polarity theory of adsorption and desorption processes in the system soil - plant.

Climatic resources and their rational use. Methodology, theory and world practice of formation and use of climate potential as an element of abiotic system and part of agrotechnologies. Climatic light, thermal and water resources, their interrelations and laws of formation of climate potential and its rational use in modern agrotechnologies.

Topic 3. Biotic potential of agricultural technologies and their rational use.

Biotic system. The composition of the biotic system - cultivated plants, weeds, pests, diseases and other organisms. The relationship between them. Energy and material relations in the biotic system of agricultural technologies.

Potential resources of modern varieties and hybrids of crops and their realizations in world agrotechnologies. Laws of space saturation by cultivated plants, their importance in shaping the productivity of crops. Correlation between the increasing biota mass and the limiting contours of the outer and inner separating surfaces of physiological exchange. Polarity and degree of content of various substances and functional activity in cultivated plants.

The vitality and development of cultivated plants in the process of movement of nutrients, energy, biotopes, etc. as a single polar and holistic organism.

Phytocenotic significance of weed communities, their dynamics and influence on the formation of agricultural technologies. Methodology, theory and world practice of regulating the abundance of weed component of agrophytocenoses in modern agro-technologies.

Pests and diseases of the biotic part of agrotechnology. Laws of formation and regulation of their numbers. Correlative relationships between elements of the biotic system. Non-parasite heterotrophic organisms of the biotic part and their influence on the formation of soil fertility and bioproductivity of crops.

Topic 4. The labor resources of world agrotechnologies and their rational use.

Labor. Geography and location of rural population. Methodology, theory and world practice of formation of labor resources taking into account the traditions, social, technical and economic conditions of the countries.

MODULE 2. Scientific systems of technological stages in world agrotechnologies and their resource supply

Content module 2. Agro-technology resources and systems of technological stages

Topic 5. Technical resources of world agrotechnologies and their rational use.

Technical agro-resources - a system of the latest machines and tools for performing technological processes. Economic, social, technical and technological principles of forming a system of machines and tools adapted to specific agrotechnologies. World strategy and tactics for the development of machines and tools and the rules for their recruitment.

Topic 6. Material resources of world agrotechnologies and their rational use.

Agrochemical material resources: fertilizers, pesticides, retardants, growth promoters, etc.

Macro- and micro-fertilizers in modern agricultural technologies. Ecological, biological, chemical and economic scientific basis of fertilizer application in modern agro-technologies. World practice of fertilizer application.

Topic 7. System of technological stages of world agrotechnologies in cultivation of field crops.

The composition, structure and functions of individual technological steps and technologies in general. Methodology, theory and world practice of formation of separate technological elements and agricultural technologies of cultivation of crops.

Economic, social, technological and economic adaptation of technological stages, their harmonization in agricultural technologies in general.

3. The structure of the discipline

Content of modules and topics	Number of hours				
	tota	у тому числі			
		lec	Pr.cl	Ind.work	Ind.task
1	2	3	4	5	6
MODULE 1 Scientific bases of world agrotechnology for cultivation of field crops and their biotic potential					
<i>Content module 1. Natural abiotic potential</i>					
Topic 1. Scientific bases of modern agrotechnology.	6	2	2		2
Topic 2. Natural abiotic potential of agrotechnologies and its rational use.	10	2	2	4	2
Topic 3. Biotic potential of agricultural technologies and their rational use.	32	12	12	4	4
Topic 4. The work resources of world agrotechnologies and their rational use.	8	4	4		
Total M1	56	20	20	8	8
MODULE 2. Scientific systems of technological stages in world agrotechnologies and their resource supply					
<i>Content module 2. Agro-technology resources and system of technological stages</i>					
Topic 5. Technical resources of world agrotechnologies and their rational use.	10	4	4	2	
Topic 6. Material resources of world agrotechnologies and their rational use.	14	6	6	2	
Topic 7. System of technological stages of world agrotechnologies in cultivation of field crops.	40	14	14	4	8

	Total M2	64	24	24	8
	Разом	120	44	44	16

Topics and plan of lectures

№	Тема та план лекції	ГОДИН
1	Topic 1. Scientific bases of modern agrotechnologies;	2
	Plan. Agrocenosis as an object of production. Formation of approaches and outlook. Natural biotic potential of agrotechnologies and its rational use.	
2	Topic 2. Time agricultural resource and its indicators;	2
	Plan. Geographical and zonal structure of resources Potential of agricultural resources in the world and in Ukraine. Assessment techniques	
3	Topic 3. Natural biotic potential of agricultural technologies;	2
	Plan. Structure and levels of biotic systems Zonal features of agrocenosis biota structure	
4	Тема 3.1. Склад та взаємовідносини між компонентами агроценозу; Topic 3.1. Composition and relationship between components of agrocenosis;	2
	Plan. Cultural plants, weeds, and other organisms as components of agrocenosis Energy and material relationships between components of agrocenoses	
5	Topic 3.2. Sort resources of modern agricultural cultures;	2
	Plan. Classification of varieties and hybrids	

	International scales of duration of vegetation, ontogenesis, etc.	
6	Topic 3.3. Pest and disease control in the biotic component of agrotechnology;	2
	Plan. Economic and economic threshold of harmfulness. Number control, quarantine, measures to prevent epiphytotia.	
7	Topic 3.4. Non-parasite heterotrophic components of agrocenoses;	2
	Plan. Aboriginal soil microflora. The role and place of soil microflora in the transport of mineral elements and their compounds. Use of industrial strains of mushrooms, expected effect. Seasonal and annual dynamics of soil microflora.	
8	Topic 3.5. Energetic and material structure of agrocenoses;	2
	Plan. Energy and material relationships in the biotic system of agrocenoses Management of organic production, utilization and decomposition processes.	
9	Topic 4. Labor resources of world agrotechnologies;	2
	Plan. Geography of location and size of rural population in Ukraine and in the world. Methodology, theory and world practice of formation of labor resources.	
10	Topic 4.1. The practice of using labor resources. Cultural and economic aspects;	2
	Plan. Cultural, social and economic prerequisites for efficient use of labor resources. Cultural and economic aspects of forming the internal market for consumption of crop products.	
11	Topic 5. Technical resources of agricultural technologies;	2
	Plan. Directions and means of mechanization of crop production Differentiation of means by directions of production	

	Topic 5.1. Formation of systems of machines and tools in species and zone technologies;	
12	<p>Plan.</p> <p>Principles of formation of systems adapted to specific agro-technologies</p> <p>World strategy and tactics for the development of machinery and tools and rules of their complectation.</p>	2
	Topic 6. Resource Potential of Agrotechnology: Fertilizers	
13	<p>Plan.</p> <p>Formation of approaches to the use of fertilizers.</p> <p>Fertilizer classification, expected effect, duration of action.</p> <p>Migration of mineral elements into the environment.</p>	2
	Topic 6.1. Resource potential of agricultural technologies: pesticides;	
14	<p>Plan.</p> <p>Forming approaches to pesticide use</p> <p>Classification of pesticides, expected effect, duration of action</p> <p>Migration of pesticides into the environment</p>	2
	Topic 6.2. Resource potential of agricultural technologies: growth regulators;	
15	<p>Plan.</p> <p>Formation of approaches to the use of growth regulators</p> <p>Classification of growth regulators, expected effect, mechanism and duration of action</p> <p>Migration of growth regulators into the environment</p>	2
	Topic 7. Systems of technological stages: soil preparation;	
16	<p>Plan.</p> <p>Formation of approaches to tillage</p> <p>The main types of tools for tillage. The main producers of tillage.</p>	2

	Modern classification and prevalence of basic tillage methods	
17	Topic 7.1. Systems of technological stages: sowing;	2
	Plan. Formation of sowing approaches The main types of seeders. The main manufacturers of seeders. Current classification and prevalence of sowing methods and technologies	
18	Topic 7.2. Systems of technological stages: care of crops;	2
	Plan. Forming approaches to crop care Crop care products. The main producers of crop care products Current classification and prevalence of crop care approaches and methods	
19	Topic 7.3. Systems of technological stages: harvesting;	2
	Plan. Formation of approaches to harvesting Harvesting equipment, classification of combines .. The main manufacturers of combines. Modern classification and prevalence of approaches and methods of collection	
20	Topic 7.4. Systems of technological stages: harvesting and storage of crops;	2
	Plan. Formation of approaches to harvesting and storage of the crop yield Means for cultivation of a crop. The main types of storage and elevators. Current classification and prevalence of crop storage approaches	
21	Topic 7.5. Approaches to the implementation of environmental agrotechnologies;	2
	Plan. Legal basis of environmental protection in the production of crop production Environmental restrictions and control of crop management in Ukraine and in the world.	

22	Topic 7.6. Receiving ecological safe crop products	2
	План. Terms and definitions of ecologically safe products . Legal bases of production of ecologically safe products in Ukraine and in the world.	
	Total	44

6. Topics of laboratory-practical classes

№	Topic	hours
1	<p>Topic 1. Scientific bases of modern agrotechnologies.</p> <p>1. Agricultural resource of time and its qualitative indicators.</p> <p>2. Natural biotic potential of agrotechnologies and its rational use. 2</p>	2
2	<p>Topic 2. Natural abiotic potential of agrotechnology and its rational use.</p> <p>1. Land, soil and climate resources as a coherent system and part of agrotechnologies.</p> <p>2. Energy and material relations between the elements of the abiotic part and the laws of formation of the abiotic potential of agricultural technologies.</p> <p>3. Influence of land structure on the formation and stability of their abiotic environment, productivity of crops, efficiency of agricultural technologies.</p>	2
3	<p>Topic 3. Biotic potential of agricultural technologies and their rational use.</p> <p>1. Potential resources of modern varieties and hybrids of crops and their realizations in world agrotechnologies.</p> <p>2. Laws of saturation of space with crops, their importance in formation the productivity of crops.</p> <p>3. The correspondence between the growing biota mass and the limiting contours of the outer and inner separating surfaces of physiological exchange.</p>	12
4	<p>Topic 4. Labor resources of the world agrotechnologies and their rational use.</p> <p>1. The calculation of the need for workers.</p> <p>2. Methodology, theory and world practice of formation of labor resources taking into account the traditions, social, technical and economic conditions of the countries.</p>	4
5	<p>Topic 5. Technical resources of the world agrotechnologies and their rational</p>	4

	<p>use.</p> <p>1. Economic, social, technical and technological principles of forming a system of machines and tools adapted to specific agro-technologies.</p> <p>2. World strategy and tactics for the development of machines and tools and the rules for their recruitment.</p>	
6	<p>Topic 6. Material resources of the world agrotechnologies and their rational use.</p> <p>1. Fertilizers.</p> <p>2. Pesticides.</p> <p>3. Growth promoters</p>	6
7	<p>Topic7 . System of technological stages of world agrotechnologies in cultivation of field crops *</p> <p>1. Methodology, theory and world practice of formation of separate technological elements and agricultural technologies of cultivation of crops.</p> <p>2. Economic, social, technological and economic adaptation of technological stages, their harmonization in agricultural technologies in general.</p> <p>*. Wheat, corn, sorghum, rice, legumes, soybeans, tubers, melons, oilseeds, essential oils, medicinal, spicy, narcotic crops.</p>	12
	Total	44

7. Individual work

№	Topics for individual work	hours
1	Topic 1-2. Development of world agrotechnologies, adapted to specific natural conditions and specialization of the economy.	4
2	Topic 3. Conduct comparative analysis of different agro-technologies and conclude on the optimal variant of agro-technologies for specific natural conditions and specialization of the farm.	4
3	Topic 7. Compilation of agrotechnical part of technological stages on world technologies of cultivation of field crops.	8

	Total	16
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8. Individual tasks

(consultancy)

№	Topics for essays-presentations	Hours
1	Topic 2. Development of world agrotechnologies, adapted to specific natural conditions and specialization of the economy.	4
2	Topic 3. Conduct comparative analysis of different agrotechnologies and conclude on the optimal variant of agrotechnologies for specific natural conditions and specialization of the farm	4
3	Topic 5. Natural abiotic potential of agricultural technologies and its rational use	2
4	Topic 6. Technical resources of the world agrotechnologies and their rational use	2
5	Topic 7. System of technological stages of world agrotechnology in cultivation of field crops	4
	Total	16

9. Teaching methods

1. Teaching methods for the source of knowledge:

1.1. Verbal: story, explanation, conversation (heuristic and reproductive), lecture, coaching, (reading, translating, writing, planning, reviewing, summarizing, producing tables, schedules, supporting notes, etc.).

1.2. Visual: demonstration, illustration, observation.

1.3. Practical: laboratory method, practical work, practical work and practical methods.

2. Teaching methods by the nature of logic of cognition.

2.1. Analytical.

2.2. Methods of synthesis.

3. Teaching methods by the nature and level of students' individual mental activity.

3.1. Problematic

3.2. Partial search

3.3. Research

3.4. Reproductive

3.5. Explanatory and demonstrative

4. Active teaching methods - use of technical means of teaching, classes at the enterprise, group researches, self-assessment of knowledge, use of educational and control tests, use of basic lectures and others).

5. Interactive learning technologies - use of multimedia technologies, interactive whiteboard, dialog learning, student collaboration and others).

In case of small groups the following teaching methods are used:

Personalized Learning

Differentiated Instruction

Inquiry-based Learning

9. Methods of control

1. Rating control over 100-point knowledge assessment scale **ECTS** (European Credit Transfer and Accumulation System).
2. Intermediate control during the semester (intermediate attestation).
3. Multicriteria rating of potential students' work:
 - level of knowledge at practical classes, laboratory and seminar work;
 - students' activity during the lesson
 - the results of laboratory works;
 - Express — control during the work at the lesson;
 - individual work with the topic or with separate issues;
 - fulfillment of analytical and calculation tasks;
 - writing tasks during tests;

Assessment of the aspirant is carried out by commission (the commission includes members of the department)

13. Knowledge assessment scale: national and ECTS

Sum of points for all kinds of educational activity	rating ECTS	Rating on a national scale
		For credit
90 – 100	A	credit
82-89	B	
75-81	C	
69-74	D	
60-68	E	

35-59	FX	not credited with the possibility of re-get the credit
1-34	F	not credited with the compulsory re-study of the discipline

10. Recommended literature

Basic

1. Agroclimatic Directory. –K .: Meteo-edition, 1966. - 40 p.
2. Likhchvor V.V., Petrichenko V.F. Plant growing. Modern intensive technologies of cultivation of basic field crops. - Lviv: Ukrainian Technologies, 2006 - 730 p.
3. M.G. Bondarenko, V.A. Demeshchuk Acquisition and use of machine-tractor park in crop production: A textbook. - K .: Higher School, 1995. - 237 p.
4. Maintenance of intensive technologies. Ex. Y.M. Sisyukin, M.K. Komarova. - M .: Rosagropromizdat, 1988. –271p.
5. List of pesticides and agrochemicals authorized for use in Ukraine. –K .: Univest Marketing, 2008-2010. - 180 p.
6. Systems and methods of rational land use. «Iowa Export-Import, 1998. - 186 p.
7. M. Shevnikov World Agrotechnologies / Tutorial. - Poltava: OJSC “Poltava Publishing House, 2005. - 244 p.

Auxiliary

1. Zinchenko O.I. Plant growing. - K .: Agrarian Education, 2001. 591 p.
2. Agriculture Abroad. // Newsletter.
3. Magazines: Suggestion, Agronomist, Grain, Sugar beet, Sugar beet, Agrarian science, Agriculture, Cereal crops, News of plant protection, Tractors and agricultural machinery, Agricultural engineering, Potatoes and vegetables, Bulletin of agrarian science, Agrocompany The achievements of science and technology in agroindustrial complex and others.

4. Babich A.O. World land, food and forage resources. - K.: Agricultural Science, 1996. -200 p.

5. Genko V.D. Krupp G. Success is determined by technology. // New agriculture, - 1998. - № 2. - P.30-33.

11. Information resources

1. The legislation of Ukraine. Website of The Verkhovna Rada of Ukraine [Electronic resource]. - Access mode: <http://zakon.rada.gov.ua>.

2. The site of the agrarian sector of Ukraine [Electronic resource]. - Access mode: <http://agroua.net>.

3. Production of basic crops in Ukraine. Website of the State Department of Statistics of Ukraine [Electronic resource]. - Access mode: <http://www.ukrstat.gov.ua>.

4. Crop production in Sumy region. Website of the Main Department of Statistics in Sumy Oblast [Electronic resource]. - Access mode: <http://www.sumy.ukrstat.gov.ua/?menu=175&level=3>.

5. Production of basic crops in the world. Food and Agriculture Organization of the United Nations. FAO [Electronic resource]. - Access mode: <http://faostat.fao.org/site/636/default.aspx#ancor>