

**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

Biological bases of plant growing
(code and academic discipline name)

Specialty 201 «Agronomy»
(code and specialty name)

**The Third higher educational level «Doctor of Philosophy»
Faculty: Agrotechnology and Environmental Use**

2019 – 2020 academic year

LETTER OF AGREEMENT
Educational - Professional Program «Biological bases of Plant Growing»
in Program Subject Area 201 «Agronomy»
Higher Education Level - Third «Doctor of Philosophy»

The project team consists of:

The head of the Plant Growing Department, 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**

(signature)

(V. I. Trotsenko)
(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	part-time study
Number of credits – 4	Knowledge area: 10 Natural Sciences	Normative	
Individual research assignment:	Specialty: 201 «Agronomy»	Year of preparation:	
		2019-2020-й	
		Course	
		2	
		Semester	
Total hours - 120		4-	
		Lectures	
	Educational degree: Doctor of Philosophy	44	
		Practical classes, seminars	
		44	
		Laboratory work	
		Individual work	
		16	
		Individual tasks: Consultations - 16	
		Type of control: credit	

2. The purpose and objectives of the discipline

Purpose: Formation in future specialists the technological preparation for the production of ecological products in plant growing.

Objectives: To provide the population with high quality food, livestock - feed, processing industry - raw materials.

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

know:

the concept and content of technology of cultivation of field crops. The influence of the main natural factors on the construction of technology, as the most appropriate system of agricultural measures in the cultivation of crops. Phase utilization rates and water consumption. Theoretical bases of optimization of energy and resource-saving technologies, their ecological purity. Peculiarities of growing of ecological products in plant growing.

be able:

to use new forms of land use and economic methods of management for the efficiency of plant growing in terms of self-sustaining in self-financing. Rational use of natural resources and environmental protection in the conditions of intensification of plant growing. To bring engineering support of technologies of cultivation of crops. Draw up technological maps of cultivation of crops. Gathering of machine-tractor units. To design intensive technologies on the basis of modern means. Ensure safe cultivation of field crops under radionuclide contamination.

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 6	Be able to analyze critically, evaluate and synthesize new scientific principles and ideas
PRN 7	Initiate, organize and conduct comprehensive research in research and innovation
PRN 11	To engage free in dialogue with the broad scientific community and the public in the relevant field of scientific and / or professional activity
PRN 12	To reflect the the results of scientific research in scientific articles published both in professional national publications and in publications included in international scientometric databases.
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 15	Being able to work with different sources, carry out, analyze and organize the information received. Understanding of scientific articles in the field of the chosen specialty. Ability to work with up-to-date bibliographic and abstract databases, as well as scientometric platforms such as Web of Science, Scopus and others. Scientific literature on the current state and tendencies of development of world and national science on the development of modern ecological-adapted cultivation technologies. Ability to analyze critically various information sources, scientific literature, research of national and foreign authors on the development of modern ecologically-adapted cultivation technologies. Ability to keep abreast of the latest developments in agricultural production and agronomy and to find scientific sources relevant to the field of scientific interests of the aspirant. Knowledge, understanding,

	skills and ability to use citation rules and references to sources used, rules for bibliographic design. Knowledge and understanding of the content and order of calculation of basic quantitative scientometric indicators of scientific activity efficiency (citation index, Hirsch index (h-index), impact factor). Ability to analyze information sources, identify contradictions and previously unsolved problems or parts of them, formulate working hypotheses.
PRN 19	Being able to make decisions, self-development and self-improvement, be responsible for the reliability and novelty of own scientific research and decision-making, be able to motivate employees to move towards a common goal

Corelation the results of the discipline with the program results

Competencies	6	PRN 7	PRN 11	PRN 12	PRN 13	PRN 15	PRN 19
SK 1	*		*	*	*		*
SK 2		*	*	*		*	*
SK 3	*	*	*	*			
SK 5		*	*	*	*		
SK 9	*		*	*	*	*	
SK 13	*		*		*	*	*

SK 1. Ability to formulate a scientific problem, develop working hypotheses, determine relevance, purpose, tasks that need to be accomplished to achieve the goal, evaluate the resources needed and time to implement, which implies a deep rethinking of existing and creation of new holistic knowledge and / or professional practice.

SK 2. Ability to integrate research into agro-industrial production and agronomy.

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

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 9. Ability to develop a system of experimental research for the practical confirmation of theoretical assumptions

and to implement it in the agro-technological process.

SK 13. Knowledge and observance of standards of scientific ethics and academic integrity

3. The program of the discipline

Topic 1. Subject, method, tasks of ecological and biological plant growing. Ecological bases of plant growing. The term ecology. Current state of ecology of Ukraine. Development of ecological relations between different branches of crop growing. Components of the biosphere, their mutual influence. Trophic connections are the basis of the biosphere. Producers, Consumers, Reducers. Negative influence of anthropogenic factor and their threat to the development of society. The doctrine of V.I. Vernadsky. Technogenic ecosystems. Technosphere.

Topic 2. The biological basis of plant growing. The concept of plant ecology. The ratio of plants to moisture. The ratio of plants to light. Influence of temperature on plant growth. Influence of temperature on the development of plants. The ratio of plants to soils. The ratio of plants to soil aeration. Separation of plants by nutrition. Agrophytocenoses and their influence on ecological situation.

Topic 3. Biological bases of crop growing. Biological features of field crops. Methods of reproduction. The regrowth of the field crops. Plant growth and development, vegetation phases. Stages of organogenesis, winter and spring forms of plants. Separation of plants by the duration of the growing season.

Topic 4. Biological methods of protection of field crops. Changes occurring in phytocenoses as a result of the use of chemical measures to control pests, weeds and diseases. Alternative control measures and their effectiveness, problems and opportunities, methods of application of biological methods of plant protection and their effectiveness.

Topic 5. Eco-friendly technologies for growing cereals. Winter wheat and spring wheat. Biological features. Varieties. Fundamentals of eco-friendly, energy-efficient growing technology. Bioenergy efficiency of winter wheat cultivation. Winter rye and spring rye. Economic significance. Biological features. Hybrids and varieties. Bioenergy efficiency of barley cultivation technology. Economic significance. Biological features. Hybrids and varieties. Fundamentals of eco-friendly, energy-efficient growing technology. Triticale. Economic significance. Biological features. Hybrids and varieties. Fundamentals of eco-friendly, energy-efficient growing technology. Maize. Economic significance. Biological features.

Hybrids and varieties. Fundamentals of eco-friendly, energy-efficient growing technology. Bioenergy efficiency of corn growing technology for grain.

Topic 6. Eco-friendly technologies for growing cereals. Buckwheat. Biological features. Harvesting. Oat. Biological features. Growing technology. Varieties. Bioenergy and economic efficiency of cultivation.

Topic 7. Eco-friendly technologies for growing legumes. Pea. Economic significance. Growing technology. Mixed pea crops with other crops. Bioenergy efficiency of pea cultivation. Soy. Biological features. Growing technology. Varieties. Soy energy efficiency.

Topic 8. Eco-friendly technologies for growing industrial crops. Sunflower. Biological features. Varieties and hybrids. Sugar and fodder beets. Features of growth and development. Biological features. Varieties and hybrids. Potato. Distribution and yield. Biological features. Varieties. Growing technology. Harvesting. Tobacco. Biological features. Distribution and yield. Biological features. Varieties. Growing technology. Harvesting. Rape. Distribution and yield. Biological features. Varieties. Growing technology. Harvesting. Linseed oil. Distribution and yield. Biological features. Varieties. Growing technology. Harvesting. Economic and bioenergy efficiency of cultivation of industrial crops.

Topic 9. Eco-friendly technologies for growing forage grasses. Annual and perennial forage grasses. Clover. Alfalfa. Sainfoin. Vetch. Timofiivka meadow. Distribution and yield. Biological features. Varieties. Growing technology. Harvesting. Economic and bioenergy efficiency of fodder grass growing.

4. The structure of the discipline

Content of modules and topics	Number of hours											
	Full-time education						Distance learning					
	total	including					total	including				
		lec	Pr.cl	Lab	Ind. work	Ind. task		l e c	Pr .cl	Lab	In d. wo rk	Ind . tas k.
1	2	3	4	5	6	7	8	9	10	11	12	13
Topic 1. Subject, method, tasks of ecological and biological plant growing. Ecological bases of plant growing	8	2	2			4						
Topic 2. The biological basis of plant production	8	2	2			4						
Topic 3. Biological methods of protection of	8	2	2			4						

field crops.												
Topic 4. Eco-friendly technologies for growing cereals	8	2	2			4						
Topic 5. Eco-friendly technologies for growing cereals	32	14	14			4						
Topic 6. Eco-friendly technologies for growing cereals	12	4	4			4						
Topic 7. Eco-friendly technologies for growing legumes	12	4	4			4						
Topic 8. Eco-friendly technologies for growing industrial crops	26	12	12			2						
Topic 9. Eco-friendly technologies for growing forage grasses	6	2	2			2						
Total	120	44	44			32						

5. Topics and lesson plan

№	Topic	Hours
1	<p>Topic 1. Subject, method, tasks of ecological and biological plant growing. Ecological bases of plant growing.</p> <p>1. The current state of ecology of Ukraine. 2. Development of ecological relations between different branches of plant growing. 3. Earth's biosphere. Trophic connections are the basis of the biosphere. 4. The doctrine of V.I. Vernadsky. 5. Technogenic ecosystems. 6. Earth's biosphere. Biogeocenosis.</p>	2
2	<p>Topic 2. The biological basis of plant growing.</p> <p>1. Methods of propagation of field crops. 2. Stages of organogenesis. 3. Evaluation of the quality of seeds of field crops. 4. Methods of preparation for sowing.</p>	2
3	<p>Topic 3. Ecological features of field crops.</p> <p>1. The concept of plant ecology. 2. Separation of plants by nutrition. 3. Agrophytocenoses and their influence on the ecological situation</p>	2
4	<p>Topic 4. Biological methods of protection of field crops.</p> <p>1. Effect of chemical protection measures on phytocenosis. 2. Alternative control measures and their effectiveness. 3. Biological methods of protection and their effectiveness</p>	2
5	<p>Topic 5. Eco-friendly technologies for growing cereals.</p> <p>1. Biological features of the first and second group of cereals. 2. Bioenergy and economic efficiency of growing cereals. 3. Ecological significance of cereals.</p>	14

6	Topic 6. Eco-friendly technologies for growing cereals. 1. Biological features of cereals. 2. Features of zonal location and bioenergy efficiency of cultivation.	4
7	Topic 7. Eco-friendly technologies for growing legumes. 1. Bioenergy efficiency of peas and soybeans. 2. Environmental impact of leguminous crops.	4
8	Topic 8. Eco-friendly technologies for growing industrial crops. 1. The value of raw materials of industrial crops in the national economy. 2. Cultivation of crops without the use of pesticides. 3. Impact of row crops on the ecological situation of fields.	12
9	Topic 9. Eco-friendly technologies for growing forage grasses. 1. Biological features of forage grasses. 2. Features of zonal location and bioenergy efficiency of cultivation.	2
	Total	44

6. Topics for practical classes

№	Topic	Hours
1	Subject, method, tasks of ecological and biological plant growing. Ecological bases of plant growing	2
2	Biological bases of plant growing.	2
3	Ecological features of field crops	2
4	Biological methods of protection of field crops.	2
5	Eco-friendly technologies for growing cereals. Winter	2
6	Eco-friendly technologies for growing cereals. Spring	2
7	Eco-friendly technologies for growing cereals. Winter rye	2
8	Eco-friendly technologies for growing cereals. Spring rye	2
9	Eco-friendly technologies for growing cereals. Barley	2
10	Eco-friendly technologies for growing cereals. Triticale	2
11	Eco-friendly technologies for growing cereals. Maize	2
12	Eco-friendly technologies for growing large crops. Buckwheat	2
13	Eco-friendly technology for growing large crops. Oat	2
14	Eco-friendly technologies for growing legumes. Soy	2
15	Eco-friendly technologies for growing legumes. Pea	2
16	Eco-friendly technologies for growing industrial crops. Sunflower	2
17	Eco-friendly technologies for growing industrial crops. Rape	2
18	Eco-friendly technologies for growing industrial crops. Linseed oil	2
19	Eco-friendly technologies for growing industrial crops. Sugar beet	2
20	Eco-friendly technologies for growing industrial crops. Tobacco.	2
21	Eco-friendly technologies for growing industrial crops. Potato	2
22	Eco-friendly technologies for growing forage grasses.	2

	Total	44
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7. Individual work

№	Topic	Hours
1	Topic 1. Subject, method, tasks of ecological and biological plant growing. Ecological bases of plant growing. 1. The term Ecology. 2. Ecosystem. 3. Producers, consumers, reducers	4
2	Topic 2. The biological basis of plant production. 1. Regrowth (fieldiness) of field crops. 2. Plant growth and development, vegetation phases. 3. Separation of plants by the duration of the growing season.	4
3	Topic 3. Ecological features of field crops. 1. The ratio of plants to light and moisture. 2. The ratio of temperature to plant growth and development. 3. The ratio of plants to soils. 4. The ratio of plants to soil aeration.	4
4	Topic 4. Biological methods of protection of field crops. 1. Changes occurring in the phytocenoses influenced by the use of chemical pest control measures. 2. Changes occurring in the phytocenoses influenced by the use of chemical weed control measures. 3. Changes occurring in the phytocenoses influenced by the use of chemical control measures.	4
	Total	16

8. Individual tasks (consultancy)

№	Topics for essays, presentations	Hours
1	Development of a technological map on energy-saving technologies of crops: wheat, rye, barley, oats, corn, buckwheat.	4
2	Development of technological map on energy-saving technologies of industrial crops: sugar beets, potatoes, sunflowers, rapeseed, flax, hemp, tobacco.	4
3	Eco-friendly technologies for growing cereals	2
4	Eco-friendly technologies for growing large crops	2
5	Eco-friendly technologies for growing legumes.	2
6	Eco-friendly technologies for growing industrial crops	2
	Total	16

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).

12. 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 abstracts;
- test results;

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 exam, course project (work), practice
90 – 100	A	excellent
82-89	B	good

75-81	C	
69-74	D	satisfactory
60-68	E	
35-59	FX	unsatisfactory with the possibility of retake the exam
1-34	F	unsatisfactory with the compulsory re-study of the discipline

10. Recommended literature

Basic:

1. Plant growing [Text]: textbook for students of higher educational establishments / V.V.Bazaliy, O.I. Zinchenko, Y. O. Lavrinenko. - Kherson: Grin D.S., 2015. - 520 p.
2. plant production with the basics of forage production [Text]: a textbook / O.M. Tsarenko, V.I .Trotenko, O.G. Zhatov. - Sumy: University Book, 2003. – 384 p.
3. Plant growing. Laboratory Workshop [Text]: textbook for students of higher educational agrarian establishments of the II-IV levels of accreditation / M.I. Mostipan. - Kirovograd: V.F. Lysenko, 2015. - 320 p.
4. plant growing: Textbook / O.I. Zinchenko, V.N. Salatenko, M.A. Belonozhko and others; Edited by O.I. Zinchenko. - K. : Agrarian education, 2001. - 591 p.
5. Organic farming: from the experience of PE "Agroecology" of Shishatsky district, Poltava region. Practical recommendations / S.S. Antonets, A.S. Antonets, V.M. Pisarenko [and others]. - Poltava: RVV PDAA, 2010. - 200 p.
6. Biological plant production / [O. Zinchenko, O.S. Alekseeva, P.M. Prikhodko and others]. - K.: High School, 1996. - 239 p.

7. Likhchvor V.V. Plant growing. Technology of cultivation of crops [Text]. No. 2 / V.V. Dachshund. - K: ZNL, 2004. - 808 p

8. Plant growing. Cultivation technologies of crops. - Lviv: Ukrainian Technologies, 2002. - 797 p.

9. Plant growing[Text]: a textbook / V.O. Kovalenko, I.A. Kovalenko, M.V. Kovtun; Ministry of Agrarian Policy and Food of Ukraine, Lugansk. nat. agrarian. Univ. - Lugansk: Elton-2, 2013. - 464 p.

Auxiliary:

1. Plant growing with the basics of processing technology. Workshop: textbook for students of higher educational establishments / A.V. Melnyk [and others]; ed. by A.V. Melnyk, V.I. Trotenko. - Sumy: University Book, 2008. - 384 p.

2. Fursova G.K. Plant growing: laboratory and practical classes [textbook for students of agronomic specialties] / G.K. Fursova, D.I. Fursov, V.V. Sergeev. - Kharkiv, 2004. - 371 p.

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 State Department of Statistics of Ukraine [Electronic resource]. - Access mode: <http://www.ukrstat.gov.ua>.

4. Plant growing 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>