Ministry of Education and Science of Ukraine
Sumy National Agrarian University
Faculty of Agrothecnology and Environmental Management

Department of Agricultural Technologies and Soil Science

Syllabus (work program) of the educational component

MODERN

GLOBAL AGRICULTURAL TECHNOLOGIES

(normative) EC 10

Implemented within the educational program

AGRONOMY, specialty H1 "Agronomy"

at the third level of higher education (Doctor of Philosophy)

Sumy - 2025

Developer: Volodymyr TROTSENKO, Doctor of Agricultural Sciences, Professor

Considered, approved and ratified at the meeting of the Department of Agricultural Technologies and Soil Science *Minutes of June 16, 2025 No. 24*

Head of the department Volodymyr TROTSENKO

Agreed:

Educational program guarantor Andriy MELNYK

Dean of the Faculty of Agrothecnology and Environmental Management Olha BAKUMENKO

Syllabus review provided Yuriy MISCHCHENKO

Methodologist of the Department of Educational Quality, Licensing and Accreditation Nadiya BARANIK

Registered in the electronic database: 26.08. **2025**

1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

1	Title of EC	**MODERN GLOBAL AGRICULTURAL**							
2	Department/chair	Agrothecnology and Environmental Management							
3	EC status	Normativ (EC 10)							
4	Program/Specialty(s) that include EC	Agronomy / H1- Agronomy							
5	EC may be offered for (for selective OK)	E2 - Ecology							
6	Level	8 level							
7	Semester and duration of study	2 course \ 3 term							
8	Number of ECTS credits	Full-time- **3,0**							
9	Total hours and their distribution	Contact work (classes)						Independent work	
		Lecture		Practical		Labs			
		full-time	.	full-time		full-time		full-time	
		20		**20**		-	-	**50**	
10	Type of control	Exams							
11	Language	Ukranian							
12	Teacher/Educational Component Coordinator	Trotsenko Volodymyr							

13	Contact information	Professor, Head of the Department of Department of Agricultural Technologies and Soil Science, Office 202, Faculty of Agrothecnology and Environmental Management mail: vtrotsenko@ukr.net Teacher profile — https://aero.snau.edu.ua/kafedri/kafedra-roslinnictva/sklad-kafedri/trotsenko/ Consultations: off-line – every Monday 13^{00}-14^{00}; on-line: Zoom, Viber - every Wednesday з 16.00 до 17.00
14	General description of the educational component	Study and systematization of approaches to the formation of technologies for growing major agricultural crops in economically developed countries of the world.
15	The purpose of the educational component	**Purpose**: Formation of theoretical and practical levels of training of specialists in specialty 201 "Agronomy" **Task:** Mastering the world practice of growing major agricultural crops. Evaluating the dynamics (zonal, climatic, economic) of the components of modern agricultural technologies. **As a result of studying the academic discipline, the student must: know**: *Historical dynamics of processes and approaches to growing agricultural crops. Biological and economic potential of sowing agricultural crops. Dynamics of sown areas, yields and production of main crops of the main producing countries. The most common international scales of plant vegetation. Chronology of the formation*

		of the market for mineral fertilizers and pesticides. Historical, zonal and economic features of the formation of technologies for growing main agricultural crops. **be able :** *Apply world experience in technological and selection support for growing agricultural crops. Forecast the dynamics of sown areas, yields and production volumes of the main agricultural crops in Ukraine and the world. Forecast (short and medium term) dynamics of the main indicators of production (and processing) of crop products.*
16	Prerequisites for studying EC, connection with other educational components of EC	**Prerequisites:**Crop production, Industrial crops, Crop breeding, General agriculture
17	Academic Integrity Policy	**Academic integrity** at SNAU is regulated by a number of regulatory documents that are posted on the official website of the HEI https://snau. edu.ua/viddil -zabezpechennya-vakosti-osviti/zabezpechennva-vakosti-osviti/akademichna-dobrochesnist/. These documents define academic integrity and contain instructions on the procedure to be followed when a participant in the educational process has violated academic integrity. Such actions as plagiarism, impersonation, fraud, fabrication, falsification, self-plagiarism, deception, and biased evaluation are considered a direct violation of academic integrity and will result in severe penalties: - re-taking of the assessment (test, exam, credit, etc.); - re-taking of the educational course; - warning; - reprimand; - expulsion from the university (Article 48 of the Law of Ukraine "On Education"). **Course policy** The student is recommended not to miss classes, to have an appropriate appearance, to diligently complete assignments, to actively participate in the educational process. In case of absence due to illness, to provide an appropriate certificate. Missed classes should be made up at a specified time by prior agreement with the teacher. The use of other sources with alternative views on certain issues is welcome in order to form a productive discussion on the problems of the academic discipline. A mandatory requirement is compliance with the norms of academic integrity. - Higher education students must systematically and systematically master the educational material. To work actively during practical classes, participate in the discussion of discussion questions and cases, and fully participate in active forms of learning. To obtain a high rating, the following conditions must be met: - - do not miss classes, do not be late; - - actively participate in the educational process; - - complete educational tasks on time; - - comprehend, analyze, understand educational material;

		- - do not be distracted by extraneous matters during classes; - - respect the opinions of other higher education applicants; - - do not use gadgets during classes without the permission of the teacher; - - pay sufficient attention to independent work; - - to earn additional points and increase their rating in the discipline, higher education students can participate in scientific conferences, prepare a scientific article, etc. - - The criteria for assessing knowledge for current control are the success of mastering knowledge and acquired skills in lectures and practical classes, which includes the ability of a higher education graduate to master the categorical apparatus, skills of generalized thinking, logic and completeness of teaching educational material, activity of work in practical classes, level of knowledge according to the results of the survey, independent study of topics as a whole or individual questions. The total number of rating points for studying the educational component per semester is calculated as the sum of points obtained according to the results of current and final controls. The maximum amount of points per semester is 100 points. - Individual tasks, written works submitted with a violation of the deadlines without good reason are evaluated with a lower score (15% of the total points for a specific class), - - Inclusivity of the educational process for people with special needs is applied taking into account their capabilities and needs (distance learning in the Moodie system, etc.).
18	Keywords	Agricultural technologies, crop productivity, world agricultural production, structure of agricultural technologies, harvest quality
19	Link to the course in the Moodie system	https://edn.sjmu.edu.ua/moodle/course/view.php 1103

2. LEARNING OUTCOMES BY EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP WITH PROGRAM LEARNING OUTCOMES

Learning outcomes on EC: After studying the educational component, the candidate is expected to be able to:...»	Program educational outcomes that the EC aims to achieve (indicate the number according to the numbering given in the EP)				Assessment of РНД
	PEO1	**PEO3**	**PEO5**	**PE)7**	
LOA 1. Apply advanced conceptual and methodological knowledge in philosophy of science, agronomy, and related fields, as well as research skills to plan and conduct relevant applied scientific research.	**X**				Multiple choice test and individual solution of calculation problems. Careful checking and analysis of completed tasks.
LOA 3. Plan and carry out theoretical and experimental research in agronomy and related scientific areas using modern methods, technologies and tools, critically analyze the results of one's own research and the results of other researchers in the context of the entire complex of modern knowledge on the problem under study.		**X**			Multiple choice test and individual solution of calculation problems. Careful checking and analysis of completed tasks.
LOA 5. Freely present and discuss research results, scientific and applied problems of agronomy with specialists and non-specialists in the state and foreign languages, competently reflect research results in scientific publications in leading international scientific publications			**X**		Multiple choice test, solving calculation problems and oral defense of practical work. Careful checking and analysis of completed tasks.
LOA 7. To deeply understand the general principles and methods of agricultural sciences, as well as the methodology of scientific research, to apply them in one's own research in the field of agronomy and teaching practice.				**X**	Multiple choice test, solving calculation problems and oral defense of practical work. Careful checking and analysis of completed tasks

3.CONTENT OF THE EDUCATIONAL COMPONENT (COURSE PROGRAM)

Topic. List of issues to be addressed within the topic	Allocation within the overall budget				Recommended sources
	Classroom work			Independent work	
	Lec.	Pr.	Labs		
Module 1 World experience in the formation of technologies in plant breeding					
Topic 1. Factors of shaping agricultural technologies	4	4		10	
Topic 1.1. History of formation and stages of development of modern agricultural technologies. Centers of civilizations and domestication of plants. Historical periods of cultivation of agricultural crops. Tropical crop production.	2	2			PS*-1,4 ER- 11,13
Topic 1.2. Sowing as a means of agricultural production. Main technological processes in crop production. Classification of modern technologies. International scales of plant vegetation	2	2			PS-1,4 ER- 1,3
Topic 2. Resources and potential of agricultural technologies	4	4		10	
Topic 2.1. Land and climatic resources of agricultural technologies Biological and economic potential of agricultural crops. Zonal features of technologies. Tropical crop production. Irrigated and rainfed crop production.	2	2			PS-2 ER- 4-7
Topic 2.2. Labor resources of agricultural technologies Key indicators of efficiency of labor resources. Availability and potential of agricultural technologies in countries of the world.	2	2			PS-2 ER- 11-15
Module 2 Material resources and world practice of cultivation technologies					
Topic 3. Material resources of technologies	4	4		10	
Topic 3.1. Production and use of mineral fertilizers. History and dynamics of mineral fertilizer production. Indicators of efficiency of mineral fertilizer use. Mineral fertilizers and the environment.	2	2			PS-4 ER- 11-15

Topic 3.2. World practice of pesticide use History and dynamics of pesticide production. Indicators of the effectiveness of pesticide use. Pesticides and the environment	2	2			PS-1,4 ER- 11-15
Topic 4. Technologies of main agricultural crops	8	8		20	
Topic 4.1. Features and components of wheat growing technologies World wheat production: dynamics and current state. Components of technologies. Range of yield and product quality.	2	2			PS-4 ER- 1-10 SS – 5,6
Topic 4.2. Features and components of corn growing technologies World corn production: dynamics and current state. Components of technologies. Range of yield and product quality.	2	2			PS-4 ER- 1-10 SS -2
Topic 4.3. Features and components of soybean growing technologies World soybean production: dynamics and current status. Components of technologies. Range of yield and product quality.	2	2			PS-1,4 ER- 1-10 SS -6-7
Topic 4.4. Features and components of sunflower cultivation technologies World oilseed production: dynamics and current state of production соняшнику. Складові	2	2			PS-1,4 ER- 1-10 SS-3,4
Total	**20**	**20**		**50**	

**- primary sources (PS);*
**- electronic resources (ER)*
**- supplementary sources (SS)*

4. TEACHING AND LEARNING METHODS

LOA	Teaching methods (work that will be carried out by the teacher during classroom lessons, consultations)	Number of hours	Learning methods (what types of learning activities the applicant must perform independently)	Number of hours
LOA 1. Apply advanced conceptual and methodological knowledge in philosophy of science, agronomy, and related fields, as well as research skills to plan and conduct relevant applied scientific research.	Educational lecture, presentation, discussion, explanation of problem solving	**10**	Taking notes, lecture notes, carefully reading them; solving calculation problems; working with additional literature; preparing reports, presentations; completing individual tasks.	**10**
LOA 3. Plan and carry out theoretical and experimental research in agronomy and related scientific areas using modern methods, technologies and tools, critically analyze the results of one's own research and the results of other researchers in the context of the entire complex of modern knowledge on the problem under study.	Educational lecture, presentation, discussion, explanations of practical work	**10**	Taking notes, lecture notes, carefully reading them; solving calculation problems; working with additional literature; preparing reports, presentations; completing an individual task; conducting laboratory research and defending the work after completion.	**20**
LOA 5. Freely present and discuss research results, scientific and applied problems of agronomy with specialists and non-specialists in the state and foreign languages, competently reflect research results in scientific publications in leading international scientific publications	Educational lecture, presentation, discussion, explanation of problem solving	**10**	Taking notes, lecture notes, carefully reading them; solving calculation problems; working with additional literature; preparing reports, presentations; completing an individual task.	**10**
LOA 7. To deeply understand the general principles and methods of agricultural sciences, as well as the methodology of scientific research, and to apply them in one's own research in the field of agronomy and teaching practice.		**10**	Taking notes lecture notes, carefully reading them; solving calculation problems; working with additional literature; preparing reports, presentations; completing an individual task; conducting laboratory research and defending the work after completion.	**10**
Total		**40**		**50**

5. EVALUATION BY EDUCATIONAL COMPONENT

When assessing the educational component, continuous assessment is used - this is a combination of summative and formative assessment. Continuous assessment is used to provide feedback to students and summative assessment with fixing grades. A prerequisite is that the assessment method allows you to check whether the established learning outcomes have been achieved or not. For this, several methods are used simultaneously.

5.1. Summative assessment

Summative assessment - summarizes the results of a student's learning activity at a certain point in time, usually at the end of modules (modules, module 2), ISW and certification. Summative assessment can be described as an assessment at the end of the course, which allows you to determine the level of student achievement, summarizing a certain stage of learning.

5.1.1. To assess the expected learning outcomes:

№	**Summative assessment methods**	**Points / Share in overall score**	**Date of taking**
1.	Multiple choice test and individual assignment, (Module 1.).	20 point**s** / 29%	5-th week
2.	Presentation, report (Independent work)	15 point**s** /21%	1-5 weeks
3.	Multiple choice test and individual assignment (Module 2.)	20 point**s** / 29%	10-th week
4.	Presentation, report (Independent work)	15 point**s** /21%	6-10 weeks

5.1.2. Evaluation criteria

Component	Unsatisfactorily	Satisfactorily	Good	Excellent
Multiple choice test and individual assignment. (Module 1).	< 7 ***points***	7-10 ***points***	11-15 ***points***	16-20 ***points***
	Task requirements are not met*	Most of the requirements are met, but some issues are not fully addressed, and there is no analysis of the studied material.	All task requirement have been met	All requirements of the task have been fulfilled, the results obtained have been clearly interpreted, proposals have been made for the improvement and refinement of specific issues, one's own opinion and vision of a certain problem have been formed, the ability to critically evaluate various sources of information, thoughtfulness have been demonstrated, conclusions have been drawn regarding the use of the knowledge gained in professional activities
Control test (multiple choice questions; midterm certification)	***< 5 point***s	***6-10 points***	***11-13 points***	***14-15 points***
	Less than 6 correct answers to the test question	6-7 correct answers to the test questions	8 correct answers to test questions	9-10 correct answers to test questions
Multiple choice test and individual assignment (Module 2)	***< 7 points***	***7-10 points***	***11-15 points***	***16-20 points***
	Task requirements have not been met*	Most of the requirements have been met, but some issues are not fully disclosed, there is no analysis of the studied material	All task requirements have been met	All requirements of the task have been fulfilled, the results obtained have been clearly interpreted, suggestions have been made for improving and perfecting specific issues, and one's own opinion and vision of a certain problem have been formed.
Presentation, report (**Independent work)**	***< 5 points***	***6-10 points***	***11-13 points***	***14-15 points***
	Task requirements have not been not met*	Most of the requirements have been met, but some questions are not fully explained, the student does not fully understand the material.	All requirements of the task have been met, fluency in the material has been demonstrated	All requirements of the task have been met, a high level of awareness of the topic assigned to the applicant has been demonstrated, the ability to critically evaluate various sources of information, thoughtfulness, and conclusions have been drawn regarding the use of the knowledge gained in professional activities.

5.2 Formative assessment

Formative assessment is a source of information about the success of learning outcomes for both teachers and students. Formative assessment is usually carried out during the study of the OC. The results of students' performance of assessment tasks help the teacher in making decisions about the nature of further learning.

№	Elements of formative assessment	Date
1	Small tests (up to 5 min.)	Weekly, at the end of the practical class
2	Cooperation of applicants in a group and the ability to work focused	Weekly, during the semester
3	Careful checking and analysis of completed tasks	Weekly, during the semester
4	Individual conversations about the results of completed tasks	Weekly, during the semester
5	Defense of practical work	Weekly, during the semester
6	Analysis of professional texts or data	Weekly, during the semester
7	Discussion of selected ways to solve the problem	Weekly, during the semester
8	Oral presentations, self-assessment and mutual assessment	2-10 week
9	Mastering skills and abilities during observation	Weekly, during the semester
10	Observing applicants in the process of completing tasks	Weekly, during the semester

5.3. Distribution of points obtained during the OK (exam) study

Ongoing assessment and independent work				Exams	**Total for Modules and ISW (TOTAL)**
Content module 10-35 ***points***		Content module 10-35 ***points***			
TI	T2	T3	T 4	30	**100**
15	**20**	**15**	**20**		

Distribution of ECTS points based on the results of study and semester (final) certification in the form of an exam:

• up to 70 points - based on the results of module control and independent work during the semester;

• up to 30 points - based on the results of the exam.

Rating scale: national and ECTS

Total points for all types of learning activities	Rating ECT8	National scale rating	
		for exam, course project (work), practice	for credit
90 - 100	**A**	excellent	enrolled
82-89	**B**	good	
75-81	**C**		
69-74	**Б**	satisfactory	
60-68	**E**		
35-59	**EX**	unsatisfactory with the possibility of reassembly	unsatisfactory with the possibility of reassembly
1-34	**E**	unsatisfactory with mandatory re-study of the discipline	unsatisfactory with mandatory re-study of the discipline

6. LEARNING RESOURCES (LITERATURE)

6.1.Primary sources

1. Бабич А. О. Світові, земельні, продовольчі і кормові ресурси. – К.: Аграрна наука,1996. – 200 с.
2. Людський розвиток в Україні. Інноваційні види зайнятості та перспективи їх розвитку: [кол. моногр.] / за ред. Е.М. Лібанової; Ін-т демографії та соціальних досліджень ім. М.В. Птухи НАН України. Київ, 2016. 328 с.
3. Паньків З.П. Земельні ресурси: Навчальний посібник. – Видавничий центр ЛНУ імені Івана Франка, 2008. – 272 с.
4. Шевніков М. Я. Світові агротехнології: Навчальний посібник. Полтава: ВАТ «Видавництво «Полтава», 2005. 192 с.
5.

6.1.1. Electronic resources

1. Виробництво основних сільськогосподарських культур за регіонами. Державна служба статистики України. Сайт Державного департаменту статистики України [Електронний ресурс]. - Режим доступу : http://www.ukrstat.gov.ua.
2. Земельні ресурси України [Електронний ресурс]. – Режим доступу: https://geoknigi.com/book.php
3. Досвід органічного землеробства [Електронний ресурс]. – Режим доступу: http://orgzem.zo.net.uac.
4. Органік в Україні / Офіційний сайт Федерації органічного руху України [Електронний ресурс]. – Режим доступу: http://organic.com.ua/uk/homepage/2010-01-26-13-42-29.
5. Журнал «Агробізнес» [Електронний ресурс]. – Режим доступу:
    a. https://agro-business.com.ua/ahrarni-kultury/zernovi.html
6. Журнал «Агроексперт» [Електронний ресурс]. – Режим доступу: https://agroexpert.ua/
7. Аналіз ринку органічної продукції в Україні / Аграрно-політичний сайт України

[Електронний ресурс]. – Режим доступу: https://agropolit.com/spetsproekty/407-analiz-rinku-organichnoyi-produktsiyi-v-ukrayini.
8. Журнал «Суперагроном» [Електронний ресурс]. – Режим доступу:
    a. https://superagronom.com/news/technologii
9. Журнал «The Ukrainian Farmer» [Електронний ресурс]. – Режим доступу: https://agrotimes.ua/ magazine/the-ukrainian-farmer/
10. Інноваційні технології використання добрив: досвід США. URL: https://www.growhow.in.ua/innovatsijni-tehnologiyi-vykorystannya-dobryv-dosvidssha/
11. Food and agriculture organization of the United Nations. FAO [Електронний ресурс]. - Режим доступу : http://faostat.fao.Org/site/636/default.aspx#ancor
12. Електронна енциклопедія сільського господарства. Режим доступу: http:.www2.agroscience.com.ua
13. Бібліотечно-інформаційний ресурс СНАУ (книжковий фонд, періодика, фонди на електронних носіях, тощо). Режим доступу: https://librarv.snau.edu.ua/.
14. Інституційний репозиторій СНАУ (наукові статті, автореферати дисертацій та дисертації, навчальні матеріали, студентські роботи, матеріали конференцій, навчальні об'єкти, наукові звіти, тощо). Режим доступу: http://repo.snau.edu.ua/
15. Національної бібліотеки України ім. В. І. Вернадського. Режим доступу: http://www.nbuv.gov.ua

6.2. Software

1. Excel.
2. Текстовий редактор Word.
3. Microsoft Office Power Point.
4. Електронна база даних з програмою «Agrobase». Веб-версія: https://agrobaseapp.com/
5. Програма Greenval. Веб-версія: https://greenval.org/about

6.3. Additional sources

1. Yuanzhi Fu, Halyna Zhatova, Yuqing Li, Qiao Liu, **Volodymyr Trotsenko** and Chengqi Li. Physiological and transcriptomic comparison of two sunflower (*helianthus annuus* l.) Cultivars with high/low cadmium accumulation. - Front. Plant Sci., 09 May **2022** | https://doi.org/10.3389/fpls.2022.854386
2. M.V. Radchenko, **V.I. Trotsenko** , A.O. Butenko, I.M. Masyk, Z.I. Hlupak, O.I. Pshychenko, N.O. Terokhina, V.M. Rozhko, O.Y. Karpenko. Adaptation of various maize hybrids when grown for biomass. Agronomy Research, **2022**, 20(2), 404–413. https://doi.org/10.15159/AR.22.028
3. Liuliu Wuac, Yongang Yua, Xiaotian Suia, Ye Taoac, HalynaZhatovac, Puwen Songa, Dongxiao Lia, Yuanyuan Guana, Huanting Gaoa, **TrotsenkoVolodymyr**, Qiaoyan Chenac, Haiyan Hua, Chengwei Liab. A novel wheat β-amylase gene *TaBMY1* reduces Cd accumulation in common wheat grains. -*Environmental and Experimental Botany*. - Volume 203, November **2022**. https://doi.org/10.1016/j.envexpbot.2022.105050
4. Li, C., Fu, Y., **Trotsenko, V**. *et al.* Understanding the physiological and molecular mechanisms of grain cadmium accumulation conduces to produce low cadmium grain crops: a review. *Plant Growth Regul* 103, 257–269 (**2024**). https://doi.org/10.1007/s10725-023-01105-x
5. Fu, Y., **Trotsenko, V.**, Li, Y. *et al.* Combined bulked segregant analysis and Kompetitive Allele-Specific PCR genotyping identifies candidate genes related to the node of the first fruiting branch in upland cotton (*Gossypium hirsutum* L.). *Euphytica* 220, 175 (**2024**). https://doi.org/10.1007/s10681-024-03432-0

6. Halyna Zhatova, **Volodymyr Trotsenko**, NadiiaTrotsenko, Mykola Radchenko, Andrii Butenko, Liudmyla Bondarieva, Inna Zubtsova. Quinoa microbiota and its importance for sustainable crop production Modern Phytomorphology: **2025** Volume: 19, 178-182 DOI: 10.5281/zenodo.200121 (10.5281/zenodo.2025-19)
7. **Volodymyr Trotsenko**, Halyna Zhatova, Vladyslav Tiutiunnyk, Andrii Butenko, Inna Kolosok, Maryna Kovalenko. Approaches to control of winter rapeseed wintering. Modern Phytomorphology. **2025,** Volume: 19. 183-187. DOI: 10.5281/zenodo.200121 (10.5281/zenodo.2025-19)