Ministry of Education and Science of Ukraine
Sumy National Agrarian University

Faculty of Agricultural Technologies and Environmental Management
Department of Horticulture and Forestry

Work program (syllabus) of the educational component

METHODOLOGY OF CONDUCTING SCIENTIFIC RESEARCH

Mandatory

Specialty	H1 Agronomy E2 Ecology
Educational program	Agronomy Ecology
Level of higher education	Third (PhD)

Sumy – 2026

Developer _____ Melnyk A. V., d. ag. s., professor

Considered, approved and ratified at the meeting of the Department Horticulture and Forestry
Minutes No 15 dated 23.06.2026

Head of the Department _____ Andriy MELNYK

Agreed:
Guarantor of the educational program _____ Andriy MELNYK

Dean of the Faculty,
where the educational program is implemented _____ Serhiy GORBAS

The review of the work program (attached) was provided by

_____ Єрмєнко С.О.
(signature) (full name)

_____ Anhelina Dudka
(signature) (full name)

Head of PhD office

Methodologist of the Education Quality Department,
licensing and accreditation _____ Nadiya BARANIK

Svitlana Yaroshchuk

Registered in the electronic database 23.06 2026

ÓSNAU, 2026 year

1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

1.	Name OK	Methodology carrying out scientific research
2.	Faculty/department	Agrotechnology and environmental management / Horticulture and forestry
3.	Status OK	Mandatory
4.	Program / Specialty (programs), component which are OK	H1 Agronomy E2 Ecology Third (PhD)
5.	OK can be offered for (*for selective OKs)*	
6.	NRC level	HPK Ukraine – Level 8 , FQ-EHEA – third cycle, EQF LLL – Level 8
7.	Semester and duration study	1st year; 1st semester, 1 0 weeks
8.	Number ECTS credits	3.0

9. General the amount of hours and their distribution	General amount hours	Contact work (classes)						Independent work	
		Lectures		Practical		Laboratory			
		daytime	absenteeism	daytime	absenteeism	daytime	absenteeism	daytime	absenteeism
	90	20	-	20	-	-	-	50	

10.	Type of control	Exam
11.	Language of instruction	Ukrainian
12.	Teacher / Educational Component Coordinator	Melnyk Andriy Vasylovych
13.	Contact information	Professor departments agricultural technologies and soil science office 2 1t of the building of agricultural technologies and environmental management email address: melnyk_ua@yahoo.com Teacher profile - https://agro.snau.edu.ua/kafedri/kafedra-sadovo-parkovogo-ta-lisovogo-gospodarstva/sklad-kafedri/melnik-andrij-vasilovich/
14.	General description educational component	The discipline "Methodology of Scientific Research" involves mastering modern methods of planning research in agronomy, methods of their implementation using electronic methods of reading information, creating databases, statistical analysis and scientific interpretation of their results, and introducing the resulting innovative products into production.
15.	Purpose of the educational component	Discipline Objective: Mastery applicants with modern methods of researching problems in agronomy , forming skills from condition and quality research soils , definition efficiency of farming systems , means land reclamation and chemicalization , carrying out breeding and seed production practices, implementing innovative developments .
16.	Prerequisites for studying OK, connection with other educational components of OP	**Prerequisites :** Deep prior basic knowledge of general methodology, Philosophy of science, Modern information technologies in scientific activities, Organization of preparation of scientific publications and dissertation writing, Communication in the scientific environment, Modern aspects of agriculture. **Post-requisites :** Organization of preparation of scientific publications and writing of dissertations; theses and articles, dissertation work.
17.	Policy academic virtue	During the educational process it is unacceptable: - use sources of information (oral (prompts), written (other people's works), printed (books, teaching aids), electronic (phones, tablets) not permitted by the teacher; - request, provide and receive assistance from third parties (including as surrogates) in passing current, module, semester and final tests; using family or work connections to obtain a positive or higher grade; - carry out or encourage by any means the change of the academic grade received; - submit for assessment written work prepared with the participation of other persons; - falsify or fabricate information, scientific results with their subsequent use in scientific papers and dissertations; - offer a bribe to obtain any advantages in educational or research activities. Facts of violations by students of the norms of the Code of Academic Integrity are submitted for consideration by the Academic Integrity Council, the powers of which are established by Section IV of the Code of Academic Integrity of the SNAU. http://docs.snau.edu.ua/documents/education/quality/kodeks_akadem_dobrochesnosti.pdf
18.	Keywords	Methods and stages of scientific research, plan and scheme, field and laboratory research, data analysis, writing theses and articles, requirements for dissertation design

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

Results training for OK: After study educational component, the applicant is expected to be able to ...		Software results learning , for achievement whose directed to OK (indicate the number according to the numbering given in the OP)				How is RND assessed ?
	PRN $_2$	PRN $_3$	PRN $_4$	PRN $_5$	PRN $_7$	
D RN 1. To put forward and test hypotheses, justify and interpret the results of theoretical analysis, experimental research, and mathematical or computer modeling.	X	X		X		Multiple test choice and individual solving calculation problems . Attentive verification and analysis completed tasks .
D RN 2 . 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 regarding the problem under study.		X				Multiple test choice and oral defense of practical work. Attentive verification and analysis completed tasks .
D RN 3 . Create information databases (electronic) and possess modern tools for searching, processing and analyzing scientific information, in particular, statistical methods for analyzing large-scale and/or complex data.			X			Multiple test choice , solving calculation problems and oral defense of practical work. Attentive verification and analysis completed tasks .
DRN 4. Deeply understand the general principles and methods of agricultural sciences, as well as the methodology of scientific research, and apply them in their own research in the field of agronomy and teaching practice.				X	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	Distribution within the overall time budget								Recommended reading
	Day uniform				Correspondence form				
	Total	Lectures	Practical	Independent	Total	Lectures	Practical	Independent	
Module 1. Basic **issues of methodology and research methods in agronomy and ecology**									
Content module 1. ***Basic principles of scientific research***									
Topic 1. Introduction. Science is a productive force in the development of society.	2	2	-	-	-	-	-	-	1, 2, 4, 6, 13
Topic 2. Scientific research is the way to solve problems .	2	2	-	-	-	-	-	-	1, 4, 6, 8, 10, 12
Topic 3. Theoretical foundations of scientific research.	6	2	4	-	-	-	-	-	3, 4, 12, 19
Content module 2. ***Methodology and methods of scientific research***									
Topic 4. Methodology, classification and stages of scientific research.	4	2	2	-	-	-	-	-	1, 2, 3, 6, 12
Topic 5. Methods and stages of scientific research.	4	2	2	-	-	-	-	-	1, 2, 3, 5, 6, 12
Topic 6. Basic issues of research methodology.	6	2	4	-	-	-	-	-	1, ,2, 5, 9, 12, 20
Topic 7. Innovation process in scientific research.	2	2	-	-	-	-	-	-	1, 4, 5, 9, 20, 22, 23, 25, 26,
Topic 8. Information support for scientific research.	2	2	-	-	-	-	-	-	1, 27, 28, 30
Topic 9. Formation of an experimental data base.	2	2	-	-	-	-	-	-	4, 7, 17
Topic 10. Organization of research in agronomy and ecology.	26	2	2	22	-	-	-	-	1, 2, 3, 20-27
Topic 11. Research methods in agronomy and ecology .	28	2	4	22	-	-	-	-	1, 2, 7, 11, 20-27
Topic 12. Field research method and its features.	31	2	6	23	-	-	-	-	1, 2, 3, 10, 16, 19-26
Module 2. Working on scientific papers and dissertations (theses or articles)									
Topic 13. Working on a scientific paper the possibility of limiting the use of AI (new law for universities)	27	2	2	15	-	-	-	-	1, 2, 3, 14-17, 25-29
Topic. 14. Registration and forms of implementation of scientific research results.	6	2	4	-	-	-	-	-	1, 2, ,3, 13-16, 30-31

Topic 15. Organization of research work of Doctors of Philosophy.	2	2	-	8	-	-	-	-	1, 2, 3
Total	**90**	**20**	**20**	**50**	**-**	**-**	**-**	**-**	

4. TEACHING AND LEARNING METHODS

DRN	**Methods teaching** (work to be carried out by a teacher during classroom lessons , consultations)	**Number of hours**		**Methods teaching** (which types educational activities has to be completed by the student independently)	**Number of hours**	
		day time	absenteeism		day time	absenteeism
D RN 1. Conduct an environmental assessment of cultivation technology from the point of view of preserving or increasing soil fertility; perform calculations using computer programs and formulate conclusions and proposals.	Educational lecture, presentation, discussion, explanation of problem solving	10	-	Keeping notes, lecture notes, carefully reading them; solving calculation problems; working with additional literature; preparing reports, presentations; completing an individual task.	10	-
D RN 2. Determine the forecast (resource) yield of the main agricultural crops; economically feasible fertilizer rates with an expert assessment of their application depending on the ratio of prices and costs.	Educational lecture, presentation, discussion, explanations of practical work	10	-	Keeping 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	-
D RN 3. To establish the conditions that occur most frequently in a specific natural and climatic zone; to ensure the implementation of all technological operations recommended by science and proven by practice for growing this crop at a high level.	Educational lecture, presentation, discussion, explanation of problem solving	10	-	Keeping notes, lecture notes, carefully reading them; solving calculation problems; working with additional literature; preparing reports, presentations; completing an individual task.	10	-
DRN 4. Deeply understand the general principles and methods of agricultural sciences, as well as the methodology of scientific research, and apply them in their own research in the field of agronomy and teaching practice.	Educational lecture, presentation, discussion, explanation of problem solving	10	-	Keeping notes, lecture notes, carefully reading them; solving calculation problems; working with additional literature; preparing reports, presentations; completing an individual task.	20	
Total		**40**	**-**		**50**	**-**

5. EVALUATION BY EDUCATIONAL COMPONENT

is used in the educational component assessment – it is a combination of summative and formative assessment. Continuous assessment is used to establish reverse communication with students and summative assessment with fixation grades . Mandatory the condition is that the evaluation method allows to verify the achieved or No installed results training . For this purpose , they are used few methods simultaneously .

5.1. Summative evaluation

Summative assessment – summarizes the student's learning activities at a certain point in time, usually at the end of modules (module 1, module 2, presentation) and certification. Summative assessment can be described as an assessment at the end of the course, which allows to determine the level of student achievement, summarizing a certain stage of learning.

5.1.1. For evaluation expected results teaching provided

No.	Methods summative evaluation	Points / Share in general assessment	Date of compilation	
			daytime	absenteeism
Module 1. Basic issues of methodology and research methods in agronomy and ecology (topics 1-12)				
1.	Defense of completed practical work or multiple choice test	20 points / 20%	1 semester up to 7 weeks	
Module 2. Working on scientific papers (theses or articles) (topics 13-15)				
2.	Defense of completed practical work or multiple choice test	20 points / 20%	1 semester up to 9 weeks	
3.	Defense and presentation of a scientific work project (object, subject, methods, design)	30 points / 30%	1 semester up to 9 weeks	
Summary control				
4 .	Exam (extended) written answer , or test for a question with multiple choice)	30 points / 30 %	1 semester in period exam . sessions	

5.1.2. Evaluation criteria

Component	Unsatisfactorily	Satisfactorily	Good	Perfectly
Defense of completed practical/ laboratory work	**< 15 points**	**15-21 points**	**19-22 points**	**23-25 points**
	Requirements for the task is not completed, practical skills have not been formed.	Most requirements done, but individual components missing or not enough to reveal, When answering practical questions, he reveals inaccuracies in his knowledge.	All done The student has practical skills, expresses his/her thoughts on certain issues, but makes certain inaccuracies and errors in the logic of presenting theoretical content or in analyzing practical content.	All done task requirements, demonstrated, creativity, reflection, freely uses acquired theoretical knowledge when analyzing practical material, expresses his/her attitude to certain problems, demonstrates a high level of mastery of practical skills.
Control test (multiple choice questions; midterm certification)	**<9 points**	**9-10 points**	**11-13 points**	**14-15 points**
	the student solved less than 60.5% of the proposed set of test tasks	the student solved 60.5-79% of the proposed set of test tasks	the student solved 80-94% of the proposed set of test tasks	– the student solved 95-100% of the proposed set of test tasks
Defense of completed scientific works	**<10 points**	**11-18 points**	**19-25 points**	**26-30 points**
	Requirements for the task is not completed, practical skills have not been formed.	Most requirements done, but individual components missing or not enough to reveal, When answering practical questions, he reveals inaccuracies in his knowledge.	All done The student has practical skills, expresses his/her thoughts on certain issues, but makes certain inaccuracies and errors in the logic of presenting theoretical content or	All done task requirements, demonstrated, creativity, reflection, freely uses acquired theoretical knowledge when analyzing practical material, expresses his/her attitude to certain

			in analyzing practical content.	problems, demonstrates a high level of mastery of practical skills.
Final test (exam)	**<12 points**	**12-21 points**	**22-27 points**	**28-30 points**
	The students partially and superficially revealed only some aspects of the question and made some significant errors, which significantly affected the overall understanding of the question.	The students correctly identified the essence of the issue, insufficiently or superficially revealing most of its individual provisions and making some errors that partially affected the overall understanding of the problem.	The students correctly identified the essence of the question, but did not fully explain it, making some minor errors that did not affect the overall understanding of the question.	The students fully and thoroughly revealed the theoretical issue, using not only the required but also additional literature.
Total	**<60**	**60-74**	**75-90**	**91-100**

5.2. Formative assessment:

To assess current progress in learning and understand areas for further improvement, formative assessment is provided . It 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 OK. The results of students' performance of assessment tasks help the teacher in making decisions about the nature of further learning.

No.	**Elements formative evaluation**	**Date**
1.	Written poll after studying topics from reverse by connection from teacher	15 min . at the end class upon completion studying the topic
2.	Oral reverse connection from teacher while working on situational tasks during classes	next occupation after study new topic
3.	Summary test control with reverse by connection from teacher	at the end of each module studied
4.	Short tests (up to 5 min)	weekly , at the end of the practical session
5.	Protection practical works	weekly , throughout the semester
6	Discussion chosen ones ways solution chosen one problems .	weekly , throughout the semester
7.	Observation of the applicant in the process implementation task .	weekly , throughout the semester
8.	Attentive verification and analysis completed tasks	weekly , throughout the semester

5.3. Distribution of points received by applicants while studying for the OK

Current testing and independent work															Total per module	Exam	Total points
Module 1 (0-20)												Module 2 (0-50)					
T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	70	30	100
1	1	1	1	2	2	2	2	2	2	2	2	15	15	20			

T1, T2 ... T15 – topics of content modules.

6. LEARNING RESOURCES (LITERATURE)

Recommended reading (basic)

1. Agronomy: a textbook for the third (educational and scientific level of higher education in the specialty H1 "Agronomy" / A. V. Melnyk, Yu. I. Danko, Yu. G. Mishchenko and others: edited by A. V. Melnyk, Yu. I. Danko. - Odessa: Oldi +, 2025. - 550 p. - (Series "To help the graduate student").
2. Mishchenko Yu. G., Prasol V. I., Davydenko G. A., Masyk I. M., Ermantraut E. R., Gudz V. P. Methods of scientific research in agronomy: a textbook, Sumy: SNAU, 2024, 103 p .
3. Klymenko M. O., Petruk V. G., Mokin V. B., Voznyuk N. M. Methodology and organization of scientific research (in ecology). – Helvetica , 2021. –474 p.
4. Medvid V. Yu., Danko Yu. I., Koblyanska I. I. Methodology and organization of scientific research (in structural and logical diagrams and tables: a textbook. – Sumy: University Book, 2020. – 219 p.
5. Zozulya O. L. Digital technologies in crop production: monograph /O. L. Zozulya, L. M. Mykhalska, O. M. Kovel, V. V. Shvartu. Kyiv: IFRG NAAS of Ukraine and LLC " Syngenta ", 2020. 72.
6. Rozhkov A. O. Research work in agronomy: a textbook: in 2 books . – Book . 2. Statistical processing of agronomic research results / A. O. Rozhkov , V. K. Puzik , S. M. Kalenska and others. – Kh.: Maidan, 2016. – 342 p.
7. PP 1/248 (2) Harmonized classification and coding of the uses of plant protection products // Bulletin OEPP/EPPO Bulletin 44 (3), (2014) 294–298.
8. PP 1/319 (1) General principles for efficiency evaluation of plant protection products with a mode of action as plant defense inducers // Bulletin OEPP/EPPO Bulletin (2020) 0 (0), 1–5. (DOI: 10.1111/epp.12692).
9. Regulation (EC) (2009) Commission Regulation (EU) No. 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repeal Council Directive 79/117/EEC and 91/414/EEC. Official Journal of the European Union L 309,1–50.
10. Regulation EC (2013) Commission Regulation (EU) No. 284/2013 of 1 March 2013 setting out the data requirements for plant protection products , in according to with Regulation (EC) No. 1107/2009 of the European Parliament and of Council concerning the placing of plant protection products on the market . Official Journal of the European Union , L 93/85.
11. Rueegg J, Siegfried W, Raisigl U, Viret O, Steffek R, Reisenzein H & Persen U (2001) Registration of plant protection products in EPPO countries : current status and possible approaches this harmonization . Bulletin OEPP/EPPO Bulletin 31, 143–152.

Methodological support

12. Vlasenko VA Methodology of scientific research / Sumy National Agrarian University . 2020. - 180 p. https :// agro . s n au . edu . ua / wp - content / uploads /2020/11/ Methodology - of - scientific - research _ compressed . pdf
13. Melnyk A. V., Melnyk T. I., Dudka A. A. Methodology of conducting scientific research / Methodological recommendations for conducting practical classes . Sumy, 2025, 29 p.
14. Osmachko O. M., Melnyk A. V., Melnyk T. I. Methodology of scientific research: methodological instructions for conducting practical classes in the discipline for students of the Master's degree program, specialties 205 "Forestry" and 206 "Landscaping". Sumy, 2023. 82 p.
15. System of standards for information, library and publishing. Bibliographic record. Bibliographic description. General requirements and rules of compilation (GOST 7.1-2003, IDT) : DSTU GOST 7.1:2006. – [Valid from 2007-07-01]. - K. : Derzhspozhyvstandart Ukrainy, 2007. – III, 47 p. – (National standard of Ukraine).
16. Introduction of a new standard for bibliographic description DSTU GOST 7.1:2006. Main differences from GOST 7.1. – 84: New rules for bibliographic description / State Scientific Institution “Book Chamber of Ukraine”. - Access mode: http://www.ukrbook.net .
17. Antonenko I. Bibliographic description of electronic resources: methodological materials for article bibliography / Antonenko I., Barkova O. // Library Bulletin. - 2006. - No. 1.- P. 25-27.
18. Regulations on the preparation and defense of master's theses / V. P. Lysenko, I. M. Verkhoglyad, V. G. Trakai and others. – Kyiv: Publishing Center of the National Academy of Sciences, 2006. – 30 p.

Auxiliary sources

19. **Melnyk A.,** Akuaku J., Melnyk T., Makarchuk A. Influence of photosynthetic apparatus on the productivity of high-oleic sunflower depending on climatic conditions in the left-bank forest-steppe of Ukraine // *Bulgarian Journal of Agricultural Science* (BJAS) Number 4. – 2020. https://www.agrojournal.org/26/04-14.pdf
20. Pei Jia, **Andrii Melnyk** , Zhi Zhang, li li , Xiang Kong, Hai Dai, Sergey Butenko. Effects of drought and rehydration on the growth and physiological characteristics of mustard seedlings // *Journal of Central European Agriculture* . - 2021 – Volume 22, Issue 4, S. 836–847. DOI: https://doi.org/10.5513/JCEA01/22.4.3246
21. Jia P., **Melnyk A.,** Zhang Z. Differential adaptation of root and shoot to salt stress correlates with antioxidant capacity in mustard. //Pakistan journal of botany. 2022. No. 54 (6). R. 2001–2011.

https :// www . pakbs . org / pjbot / papers /1655661475. pdf

22. Sergey Butenko, **Andrii Melnyk,** Tetiana Melnyk, Peipei Jia, Volodymyr Kolosok. Influence of Growth Regulators with Anti–Stress Activity on Productivity Parameters of *Sinapis alba* L. // *Journal of Ecological Engineering* 2022, 23(9), 128–135.

DOI: https://doi.org/10.12911/22998993/151780

23. **Andrii Melnyk** , Peipei Jia, Tetiana Melnyk, Andrii Butenko, Volodymyr Kolosok, and Sergey Butenko. The In fl uence of Plant Growth Regulators on Morphological Indexes and Performance of Brassica juncea L. in the Forest-Steppe of Ukraine // Atlantis press. Springer Nature. Series: Advances in Biological Sciences Research . Proceedings of the 3rd International Conference on Agriculture (ICA 2022). P. 11 - 19.

h ttps://www.atlantis-press.com/proceedings/ica-22/125987254

24. **Andriy Melnyk** , Yuriy Romanko, Anhelina Dudka, Vika Chervona , Maxim Brunyov, Evhen Sorokolit . Ecological elasticity of soy varieties' performance according to climatic factors in Ukraine. AgroLife Scientific Journal. 2022. Volume 11. No. 2. R. 91–99.

DOI: https://doi.org/10.17930/AGL2022212

25. Lee Zhuitsze **, Melnyk A. V.,** Dudka A. A., Romanko Yu. O., Melnyk T. I. Varieties features formation morphological parameters plants soybeans per application growth regulators with anti-stress action in conditions Left Bank Forest-steppe Ukraine . Tavria scientific Bulletin . 2024. No. 139.

DOI https://doi.org/10.32782/2226-0099.2024.138.11

26. Ruijie , L., Sorokolit , Ye., **Melnyk, A.** , Dudka, A., & Butenko, S. (2024). Effect of a growth regulator on the salt resistance of soybean Zheng 196 at the seeding stage. Plant and Soil Science, 15(4), 40-49.

https://doi.org/10.31548/plant4.2024.40

27. **Andrii Melnyk** , Anhelina Dudka , Yuriy Romanko , Li Ruijie , Yevhen Sorokolit , Tetiana Melnyk , Vika Chervona . Varietal features of the formation of quality indicators and amino acid composition of soybean grain under the conditions of the left bank forest-steppe of Ukraine . // Journal of Ecological Engineering 2025, 26 (5) , 366–376 .

h ttps://doi.org/10.12912/27197050/203372

28. Butenko S., **Melnyk A.,** Butenko A., Melnyk T., Dudka A., Kubrak T., Sonora Y. (2026). Analysis of the effectiveness of afforestation technologies in the North-Eastern Forest-Steppe of Ukraine. *Agriculture and Forestry*, 72 (1): 63-75. https://doi:10.17707/AgricultForest.72.1.04

Information resources

29. Official website of the Ministry of Education and Science of Ukraine https://mon.gov.ua/
30. Official website of the National Agency for Quality Assurance in Higher Education https://naqa.gov.ua/
31. Official website of the V. I. Vernadsky National Library of Ukraine http://www.nbuv.gov.ua/