

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

SUMY NATIONAL AGRARIAN UNIVERSITY

Faculty of Food Technology

Department of Food Technology and Safety

Syllabus of the educational component

of the Educational Component

MC18 FUNDAMENTALS OF SCIENTIFIC RESEARCH

(mandatory)

Implemented within the educational program

G – Engineering, Manufacturing and Construction

in specialty **G13 – Food Technology**

at **the first (bachelor's)** level of higher education

Sumy – 2026

Developer:

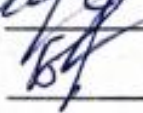


Tetiana SYNENKO,
PhD, Associate Professor of the Department of Food Technology and Safety

Reviewed, approved and approved on meetings departments Food Technology and Safety	protocol dated <u>19.05</u> 2026 No. <u>17</u>
	Manager departments <u></u> Maryna SAMILYK (signature)

Agreed:

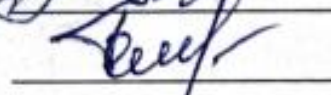
Guarantor of the educational program "Food Technologies"  Olena KOSHEL

Dean of the Faculty of Food Technology  Nataliia BOLHOVA

Review of the working program provided by:

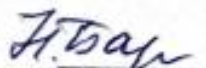


Oksana MELNYK, Candidate of Technical Sciences, Associate Professor



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N. Bananik
(first name, surname)

Registered in the electronic database: date: 18.06 2026

Information on Review of the Working Program (Syllabus)

Educational the year in which are introduced changes	Number of the appendix to the work program with a description of the changes	Changes reviewed and approved		
		Date and number minutes of the meeting departments	Head of the Department	Guarantor educational programs

1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

Name of the educational component	MC18 Fundamentals of Scientific Research					
Status of the educational component	Mandatory					
Faculty / Department	Faculty of Food Technology; Department of Food Technology and Safety					
Program / Specialty for which the component is included	Educational and Professional Program “Food Technologies” (2026): Specialty G13 Food Technologies					
NQF level	Level 6					
Semester and duration of study	Semester 1, weeks 1–15					
Number of ECTS credits	5.0					
Total workload and distribution of hours: 150	Contact work (classes)				Independent work	
	Lectures		Practical classes			
	Daily	Abroad.	Daily	Abroad.	Daily	Abroad.
	14	-	30	-	106	-
Language of instruction	Ukrainian, English					
Instructor / Coordinator of the educational component	Tetiana SYNENKO, PhD, Associate Professor of the Department of Food Technology and Safety					
Contact information	Room 317m; Tel.: +380684870521; E-mail: tatiana.synenko@snau.edu.ua					
General description of the educational component	The educational component is aimed at developing initial knowledge, abilities and skills required for organizing, conducting and presenting research activities in the field of food technologies. Students master the principles of scientific cognition, stages of research work, methods of searching, analyzing and systematizing scientific information; acquire skills in presenting research results in the form of abstracts, reports and articles in accordance with academic standards; and learn the principles of academic integrity.					
Purpose of the educational component	To develop students’ basic knowledge and skills in the organization, planning, implementation and presentation of scientific research in the field of food technologies.					
Prerequisites and links with other EPP educational components	The educational component is based on the prior study of Ukrainian Language and Academic Writing, Modern Multimedia Technologies, and Theoretical Foundations of Food Production. The component provides a basis for preparing the qualification work.					
Academic integrity policy	The study of the discipline is based on academic integrity principles and compliance with the requirements specified in the Regulation on Academic Integrity of Sumy National Agrarian University.					
Course link	https://cdn.snau.edu.ua/moodle/course/view.php?id=6377					
Keywords	scientific research, methodology, scientific problem, experiment, academic integrity, scientific creativity					

2. LEARNING OUTCOMES OF THE EDUCATIONAL COMPONENT AND THEIR RELATION TO PROGRAM LEARNING OUTCOMES

After completing the educational component, the student is expected to be able to:

Code	Course Learning Outcome «After studying the educational component, the student is expected to be able to... »	Program Learning Outcome(s) addressed						Assessment methods
		PLO4	PLO5	PLO6	PLO14	PLO18	PLO30	
CLO1	Search and process scientific and technical information from various sources and apply it to solve specific technical and technological tasks.							Preparation and defense of practical works; modular testing; mini-project of scientific research; participation in scientific conferences, seminars and student competitions.
CLO2	Develop or improve technological processes for processing raw materials of animal and plant origin, with control of physicochemical, biochemical and microbiological transformations of raw material components during the technological process.		x					
CLO3	Identify and analyze the main factors influencing the processes of synthesis, transformation and metabolism of food components, and substantiate the physiological role of nutrients in human nutrition.			x				
CLO4	Make rational technical and technological decisions and increase production efficiency by implementing resource-saving and competitive technologies.				x			
CLO5	Implement innovative developments in production and justify the feasibility of their implementation, taking into account socially significant issues, fundamentals of economics, logistics and information technologies, and analyze the state and dynamics of demand for food products.				x			
CLO6	Plan and conduct scientific research both independently and as part of a scientific group.					x		

Code	Course Learning Outcome «After studying the educational component, the student is expected to be able to... »	Program Learning Outcome(s) addressed						Assessment methods
		PLO4	PLO5	PLO6	PLO14	PLO18	PLO30	
CLO7	Model technological processes of food enterprises and restaurant establishments, taking into account current trends and innovations for their rapid adaptation to production conditions.						x	
CLO8	Present intermediate and final results of scientific research to the scientific community in the form of abstracts, reports, articles, reports, author documents and qualification work.						x	

Competencies Improved / Acquired through Non-formal Education

Non-formal education course	Competencies	Evidence of learning outcomes
Academic Integrity at the University	General: ability to learn and master modern knowledge; skills in using information and communication technologies; ability to make decisions and act according to the principle of non-acceptance of any manifestations of dishonesty. Professional: knowledge of academic integrity principles and ability to apply them in educational and professional activities.	Certificate of successful completion indicating the number of hours. The authenticity of the certificate can be verified using the link provided on it.
From Beginner to Expert in AI	General: ability to learn and master modern knowledge; ability to show initiative and entrepreneurship; skills in using information and communication technologies. Professional: development of subject-methodological and digital competence in the use of artificial intelligence; integration of acquired skills into professional, educational and scientific activities.	Certificate of successful completion indicating the number of hours. The authenticity of the certificate can be verified using the link provided on it.

3. CONTENT OF THE EDUCATIONAL COMPONENT (PROGRAM ACADEMIC DISCIPLINE)

Topic. List of issues to be addressed within the topic	Lecture hours (Daily /Abroad.)	Practical or independent-study hours (Daily /Abroad.)	Recommended literature
MODULE 1			
Lecture 1. Essence, tasks and stages of scientific research. The role of science in the development of food technologies 1. Concept of science. Main functions of science (cognitive, cultural, social, production). 2. Classification of scientific research by object and method. 3. Current state and role of science in the development of food technologies. 4. Structure and organization of research activities in higher education institutions. 5. Role of digital technologies in the development of scientific research.	2		1–9
Practical class 1. Types of scientific research in the food sector.		2	1–9
Practical class 2. Formulation of the problem, aim, tasks and hypothesis.		2	1–9
Independent study: Study of examples of modern research in food technologies.		15	1–9
Lecture 2. Methodology and methods of scientific cognition 1. Methodology of science: concept, levels and structure. 2. Main methods of scientific cognition: empirical, theoretical and general scientific methods. 3. Methods of induction, deduction, modeling, analysis and synthesis. 4. Specific features of applying methods in the food sector. 5. Selection of research methods depending on the aim and tasks. 6. Digital science tools. Use of intelligent systems in research planning.	2		1–9
Practical class 3. Selection of empirical and statistical methods.		2	1–9
Practical class 4. Selection of research methods in food technologies.		2	1–9

Topic. List of issues to be addressed within the topic	Lecture hours (Daily /Abroad.)	Practical or independent- study hours (Daily /Abroad.)	Recommended literature
Independent study: Research methodologies. Examples and comparison.		15	1–9
Lecture 3. Stages of scientific research 1. Main stages of scientific research: problem formulation, formulation of the aim and tasks, hypothesis, selection of methods, experiment, analysis of results. 2. Formulation of the object, subject and tasks of research. 3. Development of a research program. 4. Innovative approaches to experiment design. 5. Examples of the structure of scientific research in food technologies.	2		1–9
Practical class 5. Object, subject and novelty of research.		2	1–9
Practical class 6. Development of a research program.		2	1–9
Independent study: Development of a scientific project.		16	1–9
Lecture 4. Search and analysis of scientific information 1. Sources of scientific information: primary sources, reviews, monographs, dissertations. 2. Principles of literature search: keywords, Boolean operators and filters. 3. Working with databases: Google Scholar, Scopus, Web of Science, Scientific Periodicals of Ukraine. 4. Open Science and AI assistants. 5. Fundamentals of critical literature analysis. 6. Preparation of a literature review.	2		1–9
Practical class 7. Work with electronic scientific databases.		2	1–9
Practical class 8. Critical analysis of sources: credibility and relevance. Writing a literature review.		2	1–9
Independent study: Use of artificial intelligence in searching scientific information. Advanced tools for evaluating scientific sources (H-index, Altmetrics, Google Scholar, Publish or Perish, ResearchRabbit).		15	1–9

Topic. List of issues to be addressed within the topic	Lecture hours (Daily /Abroad.)	Practical or independent- study hours (Daily /Abroad.)	Recommended literature
Non-formal education: Academic Integrity at the University 1. Introduction. 2. Academic integrity. 3. Plagiarism. 4. Academic writing. 5. Preconditions for creating an integrity-based university environment. 6. How to create an integrity-based university environment.		10	https://vumonline.ua/course/academic-integrity-at-the-university/
MODULE 2			
Lecture 5. Planning and conducting an experiment 1. Principles of a scientific experiment. 2. Types of experiments: laboratory, field and modeling. 3. Experiment planning: selection of variables, control and repeatability. 4. Features of conducting experiments in the food industry. 5. Calculation of errors and reproducibility of results. 6. Digitalization and robotization.	2		1–9
Practical class 9. Designing and conducting an experiment.		2	1–9
Practical class 10. Basics of statistical analysis of results. Processing of results: mean values, errors and visualization.		2	1–9
Independent study: Digital tools for experiment planning.		15	1–9
Lecture 6. Fundamentals of scientific creativity. Formatting scientific texts 1. Scientific language: style, structure and formatting requirements. 2. Types of scientific texts: report, abstract, article, course project and diploma project. 3. Structure of a scientific article: introduction, materials and methods, results, discussion, conclusions. 4. Rules for formatting tables, graphs and formulas. 5. Requirements for citation and references. 6. Scientific communication and visualization of results. New formats.	2		1–9
Practical class 11. Basics of scientometrics. Analysis of examples.		2	1–9

Topic. List of issues to be addressed within the topic	Lecture hours (Daily /Abroad.)	Practical or independent- study hours (Daily /Abroad.)	Recommended literature
Practical class 12. Construction of graphs, tables and diagrams in scientific presentation.		2	1–9
Independent study: Creation and formatting of a scientific document using Grammarly, ChatGPT and SciSpace to check structure and style.		15	1–9
Lecture 7. Ethics and academic integrity; artificial intelligence in the scientific environment 1. Academic integrity: concept and main principles. 2. Copyright in scientific activity. 3. Publication ethics. 4. Challenges of AI use: plagiarism or a tool?	2		1–9
Practical class 13. Academic integrity and plagiarism checking.		2	1–9
Practical class 14. Preparation of an abstract/article on a selected topic.		2	1–9
Practical class 15. Preparation of a presentation and report on a selected topic.		2	1–9
Independent study: Detection of academic plagiarism. Plagiarism-checking software. AI services for self-checking.		16	1–9
Non-formal education: From Beginner to Expert in AI 1. Generating texts and images. 2. Content generation. 3. Work with documents, tables and text translation. 4. Use of different AI tools. 5. Creation and configuration of AI agents and assistants.		10	https://vid-pochatkivcya-do-eksperta-v-ai-study.academyocean.com/
Total for the course	14	practical: 30; independent study: 106	

4. TEACHING AND LEARNING METHODS

CLO	Teaching methods	Hours	Learning methods	Hours
CLO1– CLO8	Interactive lectures: use of multimedia presentations, diagrams, videos, discussion of real research cases, mini-discussions or online voting (Mentimeter, Kahoot). Problem-based learning (PBL): formulation of a real or simulated scientific problem in the food sector; group work to find ways to research and solve it. Flipped classroom: independent study of theory (videos, podcasts, articles), followed by practical discussion in the classroom and reflective tasks. Practical learning: conducting students' own mini-research with staged defense. Demonstration of digital and AI tools: use of templates, infographics and bibliography generators.	44	Active learning: small-group discussions and brainstorming based on a literature review. Inquiry-based learning: students formulate questions and hypotheses and investigate them using real data or simulated experiments. Project-oriented learning: individual or group research in food technologies, presentation of results and defense before the audience. Digital learning: independent work with online databases, scientometric platforms and computer programs for processing, formatting and presenting results. Reflective learning: keeping a researcher's diary/workbook, self-assessment and discussion of personal research progress.	106

5. ASSESSMENT FOR THE EDUCATIONAL COMPONENT

5.1. Summative Assessment

The following methods are used to assess expected learning outcomes:

No.	Summative assessment method	Points / weight in the final grade	Deadline
Module 1 (40 points)			
1	Defense of practical works (7 works × 2 points)	14 points / 14%	Within 5 days after the class
2	Testing (multiple-choice test)	26 points / 26%	Week 7
3	Non-formal education (additional/bonus)	10 bonus points	Week 7
Module 2 (60 points)			
4	Defense of practical works (8 works × 2 points)	16 points / 16%	Within 5 days after the class
5	Participation in a conference or competition; preparation and publication of an abstract/article	20 points / 20%	Week 15
6	Testing (multiple-choice test)	24 points / 24%	Week 15
7	Non-formal education (additional/bonus)	10 bonus points	Week 15

5.1.2. Assessment Criteria

Component	Criteria
Defense of a practical work	0 points: the student completed the practical work but did not defend it. 1 point: most requirements are met, but some elements are missing. 1.5 points: all task requirements are met. 2 points: all task requirements are met; thoughtful work is demonstrated and an original solution to the problem is proposed.
Testing (multiple-choice test)	The test includes 26 questions in Module 1 and 24 questions in Module 2. Each correct answer is worth 1 point.
Participation in an international/national conference or student research competition	Confirmed participation is evaluated within the course assessment according to the approved scoring scheme.
Preparation of an abstract/article	Preparation of a scientific work (abstract or article) is evaluated at up to 20 points.
Non-formal education	Successful completion of an online course confirmed by a named certificate is evaluated as 10 bonus points.

5.2. Formative Assessment

The following elements are used to assess current learning progress and identify areas for further improvement:

No.	Formative assessment element	Date
1	Oral questioning after studying course topics	Within 5 days after the class
2	Oral feedback from the instructor and students during practical classes	During the semester
3	Feedback through discussion of intermediate and final testing	Weeks 7 and 15
4	Feedback through discussion of the non-formal education course, conference report, article or scientific work	Before and after completing the course, participating in the conference/competition, or publishing the work

Final assessment form – differentiated credit. The final number of points for the discipline (maximum 100 points per semester) is determined as the sum of points earned by the student during the semester.

A student is not admitted to the final assessment if the student has missed and not made up more than 20% of classes, has not completed modular control stages, has not completed the mandatory list of works and tasks provided in the working curriculum for the semester, or has an unsatisfactory semester rating (0–41 points).

6. EDUCATIONAL RESOURCES (LITERATURE)

Main Sources

1. Fundamentals of Scientific Research: lecture course for higher education applicants of the Educational and Professional Program “Food Technologies” of full-time and part-time forms of study, Bachelor’s degree / compiled by T.P. Synenko. Sumy: SNAU, 2025. 100 p. (Minutes No. 2 dated 30 September 2025). <https://surli.cc/rbrdsc>
2. Fundamentals of Scientific Research: methodological recommendations for practical works for higher education applicants of the Educational and Professional Program “Food Technologies” of full-time and part-time forms of study, Bachelor’s degree / compiled by T.P. Synenko. Sumy: SNAU, 2025. 77 p. (Minutes No. 2 dated 30 September 2025). <https://surli.cc/emdfm>
3. Fundamentals of Scientific Research: methodological recommendations for independent work of higher education applicants of the Educational and Professional Program “Food Technologies” of full-time and part-time forms of study, Bachelor’s degree / compiled by T.P. Synenko. Sumy: SNAU, 2025. 46 p. (Minutes No. 2 dated 30 September 2025). <https://surli.cc/ahohtu>
4. Fundamentals of Scientific Research: workbook for practical works for higher education applicants of the Educational and Professional Program “Food Technologies” of full-time and part-time forms of study, Bachelor’s degree / compiled by T.P. Synenko. Sumy: SNAU, 2025. 78 p. (Minutes No. 2 dated 30 September 2025). <https://surli.cc/ywrdxl>

Additional Sources

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3. DSTU 7093:2009. Bibliographic record. Abbreviation of words and phrases in foreign European languages.
4. DSTU 8302:2015. Information and documentation. Bibliographic reference. General provisions and rules of compilation.
5. DSTU GOST 7.1:2006. System of standards on information, librarianship and publishing. Bibliographic record. Bibliographic description. General requirements and rules of compilation.
6. Methodology of Scientific Research / V.I. Ladyka, L.Z. Shylman, F.V. Pertsevoi et al. Kherson: Oldi+, 2022. 222 p.
7. Synenko T.P., Frolova N.E. Modeling and optimization of enzymatic hydrolysis of whey proteins. Herald of Lviv University of Trade and Economics. Technical Sciences. 2021. No. 25. P. 111–119. URL: <https://doi.org/10.36477/2522-1221-2021-25-15>
8. Synenko T.P., Yurchenko V.Yu. Development of muffin technology with increased biological and nutritional value. Scientific Bulletin of the Tavria State Agrotechnological University. 2024. Vol. 14, No. 2. URL: <https://doi.org/10.32782/2220-8674-2024-24-2-22>
9. Synenko T.P., Havryliuk O.S. Determining the effect of hemp bran on yogurt quality indicators. Scientific Bulletin of the Tavria State Agrotechnological University. 2024. Vol. 14, No. 2. URL: <https://doi.org/10.32782/2220-8674-2024-24-2-14>
10. Synenko T.P., Bolhova N.V. Development of the natural flavoring additive “Meat flavor”. Bulletin of Sumy National Agrarian University. Series: Mechanization and Automation of

Electronic Resources

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2. Scientific Library of Sumy National Agrarian University – <https://library.snau.edu.ua>
3. V.I. Vernadskyi National Library of Ukraine – www.nbuv.gov.ua
4. Register of Scientific Professional Publications of Ukraine – <https://nf.v.ukrintei.ua>
5. Online reference generator – <https://www.grafiati.com/uk/blogs/dstu-8302-2015-referencing-generator>