

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
Sumy National Agrarian University
Faculty of Food Technologies
Department of Food Technology

Syllabus of the educational component

EC 8 INDUSTRIAL ECOLOGY OF PROCESSING ENTERPRISES

(name and status (required/optional))

Implemented within the educational program

Food Technology

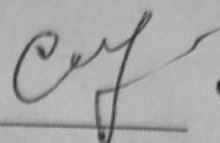
in specialty **181 Food Technology**

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

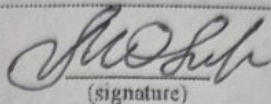
Sumy – 2026

Developer

Associate Professor of the Department
of Food Technology

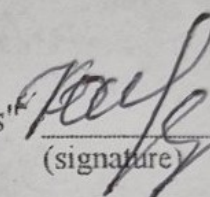


Olha SEREDA

Reviewed, approved and approved on Meetings departments <u>food technology</u> (name of department)	protocol dated 02.06.2026 No. <u>21</u>	
	Manager Departments	 (signature) <u>Oksana MELNYK</u> (last name, initials)

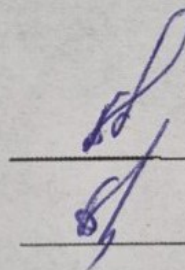
Agreed:

Guarantor of the educational program "Food Technologies"



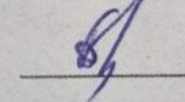
Olena KOSHEL
(full name)

Dean of the Faculty of Food Technology,
where the educational program is implemented

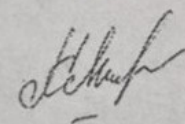


Nataliia BOLHOVA

Review of the work program provided by:

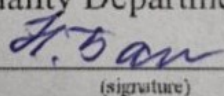


Natalia BOLGOVA



Maryna SAVSHENKO

Methodologist of the Education Quality Department.
licensing and accreditation



(N. Baranik)

Registered in the electronic database: date: 25.06. 2026

♥ SNAU, 2026 year

Information about reviewing the work 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

1.	EC	EC INDUSTRIAL ECOLOGY OF PROCESSING ENTERPRISES		
2.	Faculty/department	Faculty of Food Technology, Department of Food Technology		
3.	Status EC	Elective		
4.	Program/Specialty(s) that include OK for	EVP " "Food Technologies" of the first (bachelor's) level of higher education in the specialty (2026) 181 Food Technologies "		
5.	NQF level	Level 6		
6.	Semester and duration study	1nd semester, 15 weeks		
7.	Number of credits ECTS	5 credits		
8.	Total hours and their distribution	Contact work (classes)		Independent work
		Lecture	Practical /seminar	
		14		46
9.	Language of instruction	Ukrainian, english		
10.	Teacher/Coordinator educational component	Sereda Olha Grigorivna, Associate Professor of the Department of Food Technology		
10.1	Contact information	seaol@ukr.net		
11.	General description educational component	is aimed at forming in higher education applicants a systematic understanding of the environmental aspects of the functioning of food and processing industry enterprises. The discipline examines the main sources of man-made environmental pollution, mechanisms of industrial pollution formation, characteristics of wastewater, solid and gaseous waste, as well as modern methods of their purification, utilization and minimization. Special attention is paid to the implementation of resource-saving, energy-efficient, low-waste and waste-free technologies that ensure environmental safety of production and comply with the principles of sustainable development.		
12.	The purpose of education component	The purpose of the educational component is to form in higher education students theoretical knowledge and practical skills in assessing the environmental impact of processing enterprises on the environment, analyzing pollution sources, substantiating methods of wastewater treatment and waste disposal, as well as developing and implementing environmentally safe, resource-saving and low-waste technological solutions in food production.		
13.	Prerequisites for studying EC, connection with other educational components of the EVP	Theoretical foundations of food production, Chemistry, Biochemistry Processes and devices of food production, Automation of production processes of food enterprises and food processing plants, Life safety and labor protection, Standardization, certification, quality and safety management of food products		
14.	Academic policy virtue	The study of the OK is based on the principles of academic integrity, honesty, independence and responsibility during the performance of all types of educational activities. Participants in the educational process are obliged to comply with the requirements specified in the "Regulations on Academic Integrity of Sumy National Agrarian University". Violations of academic integrity are considered, in particular, plagiarism, self-plagiarism, fabrication, falsification, copying, deception and submission of other people's work results as their own. In the event of detection of facts of violation of academic integrity, in particular if a student submits another student's work as his own, such work is canceled without the right to be credited and is subject to re-performance..		
15.	Link to the course in Moodle system	https://cdn.snau.edu.ua/moodle/course/view.php?id=6397		
16.	Key words	food enterprises, industrial ecology, processing enterprises, cleaning		

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

After completing the internship, the applicant is expected to be able to:	Program learning outcomes that the VC aims to achieve (indicate the number according to the numbering given in the OP profile)							How is the DRE assessed?
	PLO 1	PLO 3	PLO 7	PLO 14	PLO 16	PLO 17	PLO 29	
DLO 1. Know the main environmental problems of food enterprises, sources of pollution and their impact on the environment in the processes of food production.	x							Performing and defending laboratory work, Computer-based testing
DLO 2. Be able to apply modern information technologies for collecting, analyzing and evaluating environmental indicators, as well as controlling technological processes of food.		x						
DLO 3. Be able to justify and implement resource-saving, energy-efficient and low-waste technologies to increase the environmental efficiency of food enterprises.			x					
DLO 4. Know the requirements of environmental safety, labor protection and be able to ensure safe working conditions during production activities.				x				
DLO 5. Be able to organize the process of waste disposal and carry out a comprehensive assessment of raw materials and auxiliary materials in order to ensure the ecological cleanliness of production.					x			

3. CONTENT EDUCATIONAL COMPONENT (PROGRAM ACADEMIC DISCIPLINE)

Topic. List of issues to be addressed within the topic	Distribution within the overall time budget			Recom- mended reading ⁵
	Classroom work		Inde- pendent work	
	lectures	laboratory work		
Module 1. Fundamentals of industrial ecology and wastewater management of food enterprises				
Lecture 1. Theoretical foundations of industrial ecology of processing enterprises 1. Introduction. Subject and methods of the discipline "Industrial ecology of processing enterprises". 2. The significance of the discipline for the training of process engineers. 3. The role of the discipline in ensuring the ecological safety of the environment. 4. Environmental factors and their characteristics.	2			[1-5]
Laboratory session 1. Familiarization with the main environmental indicators of processing enterprises and methods of their assessment		2		
Independent study questions 1. History of development and leading scientists in the field of industrial ecology. 2. Assessment of the impact of environmental factors on the functioning of processing enterprises			12	
Lecture 2. Wastewater pollutants and methods of their treatment 1. Pollutants of industrial effluents and wastewater. 2. General characteristics of pollutants of organic and inorganic origin. 3. Mechanical, physicochemical and biological methods of wastewater treatment.	2			[3, 5, 12]
Laboratory lesson 2. Determination of physicochemical parameters of wastewater (pH, temperature, odor, turbidity)		2		
Laboratory lesson 3. Study of the content of organic and inorganic pollutants in wastewater.		2		
Questions for independent study 1. Modern technologies of membrane wastewater treatment. 2. Use of sorbents in water treatment systems 3. Comparative assessment of the effectiveness of mechanical, physicochemical and biological wastewater treatment			12	
Lecture 3. Disinfection of wastewater from processing enterprises. 1. Chlorination and ozonation of wastewater. 2. Use of UV rays in wastewater disinfection. 3. Impact of wastewater disinfection on the environment.	2			
Laboratory lesson 4. Evaluation of the effectiveness of UV disinfection of wastewater from processing enterprises		4		[3, 5, 13, 14]
Questions for independent study: 1. Alternative methods of wastewater disinfection. 2. Environmental consequences of the use of reagent disinfection methods. 3. Study of the effectiveness of chlorination and ozonation of wastewater			12	
Total module 1	6	10	36	

Module 2. Greening of food production and modern waste management technologies				
Lecture 4. Environmental aspects of enterprises for processing raw materials of animal origin 1. Environmental features of meat, fish and dairy processing enterprises. 2. Main types of waste and sources of their formation. 3. Methods of waste collection, processing and disposal.	2			[1-4]
Laboratory lesson 5. Analysis of the composition of waste from enterprises for processing raw materials of animal origin		4		
Laboratory lesson 6. Assessment of the ecological load of wastewater from meat, fish and dairy processing enterprises		4		
A question of independent study 1. Secondary use of by-products. 2. Environmental risks of biowaste disposal 3. Choosing effective methods of animal waste disposal			12	
Lecture 5. Ecological aspects of plants processing enterprises 1. Ecological features of bakery, flour, grain and oil and fat industries. 2. Types of waste and ways of their minimization. 3. Sewage treatment and reuse of resources.	2			[1-4]
Laboratory lesson 7. Analysis of sources of waste generation in bakery production		4		
Laboratory lesson 8. Assessment of raw material losses in flour and grain production		4		
Lecture 6. Environmental aspects of food industry enterprises 1. Sources of waste generation in restaurants. 2. Fat drains, food waste and packaging materials. 3. Ecological measures of resource conservation in HoReCa.	2			
Laboratory lesson 9. Analysis of food waste in a restaurant		4		[2, 8, 9, 15]
Laboratory lesson 10. Environmental audit of a restaurant establishment		4		
A question of independent study 1. Food waste management in HoReCa. 2. Zero-waste concept in the restaurant business. 3. Assessment of fatty effluents of restaurant enterprises 4. Study of the effectiveness of grease traps			14	
Lecture 7. Modern waste disposal technologies of food enterprises 1. Bioconversion of organic waste. 2. Solid, liquid and gaseous waste disposal technologies. 3. Waste-free and low-waste technologies in the food industry.	2			[1-5]
Laboratory class 11. Analysis of modern technologies of organic waste composting		4		
Laboratory lesson 12. Development of the concept of waste-free food production		4		
A question of independent study 1. Circular economy in the food industry. 2. ESG approaches in enterprise management. 3. Evaluation of the efficiency of biogas technologies 4. Calculation of resource efficiency of low-waste production			14	
Total module 2	8	36	54	
Total	14	46	90	

4. TEACHING AND LEARNING METHODS

DLO	Teaching methods (work that will be carried out by the teacher <u>during</u> <u>classroom lessons</u> , <u>consultations</u>)	Number of hours (day/night)	Teaching methods (what types of learning activities should <u>the student</u> <u>perform?</u> <u>independently</u>)	Number of hours (days / weeks)
DLO 1. Know the main environmental problems of food enterprises, sources of pollution and their impact on the environment in the processes of food production.	Problem lectures (questions are raised regarding the material covered by the teacher, but the lecturer himself answers them, to focus students' attention on the main point) Presentations (demonstration of information regarding the topic of the lectures) Case method (the applicant is given the task of organizing his own project to develop a concept for waste-free food production and its presentation)	14	Laboratory classes (performing tasks according to the methodological instructions) Brainstorming (short tasks are set, the applicant must solve them quickly) Individual tasks (independent processing of self-study questions)	136
DLO 2. Be able to apply modern information technologies for collecting, analyzing and evaluating environmental indicators, as well as controlling technological processes of food				
DLO 3 . Be able to justify and implement resource-saving, energy-efficient and low-waste technologies to increase the environmental efficiency of food enterprises.				
DLO 4. Know the requirements of environmental safety, labor protection and be able to ensure safe working conditions during production activities.				
DLO 5. Be able to organize the process of waste disposal and carry out a comprehensive assessment of raw materials and auxiliary materials in order to ensure the ecological cleanliness of production.				

5. EVALUATION BY EDUCATIONAL COMPONENT

5.1. Summative assessment

5.1.1 To assess the expected learning outcomes, there are

<i>№</i>	<i>Summative assessment methods</i>	<i>Points / Weight in the overall assessment</i>	<i>Date of preparation</i>
	<i>Module 1 (50 points)</i>		
1.	<i>Assessment of knowledge through the defense of laboratory classes</i>	<i>20 points / 20%</i>	<i>1-7 weeks</i>
2.	<i>Computer testing</i>	<i>20 points / 20%</i>	<i>7 weeks</i>
3.	<i>Public speech with visual support of the topic of the report (abstract)</i>	<i>10 points / 10%</i>	<i>7 weeks</i>
	<i>Module 2 (50 points)</i>		
4.	<i>Assessment of knowledge through the defense of laboratory classes</i> <i>Оцінка знань шляхом захисту лабораторних занять</i>	<i>20 points / 20%</i>	<i>8-14 weeks</i>
5.	<i>Computer testing</i>	<i>20 points / 20%</i>	<i>14 weeks</i>
6.	<i>Public speech with visual support of the topic of the report (abstract)</i>	<i>10 points / 10%</i>	<i>14 weeks</i>
7.	<i>differential credit</i>	<i>60 – 100 points</i>	<i>15 weeks</i>

5.1.2. Evaluation criteria

<i>Component</i>	<i>Unsatisfactory</i>	<i>Satisfactory</i>	<i>Good</i>	<i>Excellent</i>
<i>Assessment of knowledge through testing and defense of laboratory exercises</i>	<i><13 points</i>	<i>14-16 points</i>	<i>16-18 points</i>	<i>19-20 points</i>
	Task requirements not met	Most requirements met, but individual components are missing or insufficiently disclosed, there is no analysis of other approaches to the issue	All task requirements met	All task requirements met, demonstrated creativity, thoughtfulness, proposed own solution to the problem
<i>Computer-based testing (multiple choice test - 24 questions)</i>	<i><13 points</i>	<i>14-16 points</i>	<i>16-18 points</i>	<i>19-20 points</i>
<i>Public speech with visual support of the topic of the report (abstract)</i>	<i><4 points</i>	<i>4-6 points</i>	<i>7-9 points</i>	<i>10 points</i>
	Task requirements not met	Most requirements met, but individual components are missing or insufficiently disclosed, there is no analysis of other approaches to the issue	All task requirements met	All task requirements met, demonstrated creativity, thoughtfulness, proposed own solution to the problem
<i>Differential credit</i>	<i><60 points</i>	<i>60-74 points</i>	<i>75-89 points</i>	<i>90-100 points</i>
	Task requirements not met	Most requirements met, but individual components are missing or insufficiently disclosed, there is no analysis of other approaches to the issue	All task requirements met	All task requirements met, demonstrated creativity, thoughtfulness, proposed own solution to the problem

5.2 Formative Assessment:

To assess current progress in learning and understand areas for further improvement

№	Elements of formative assessment	Date
1	Oral survey after studying the course topics	within 5 days after the class
2	Oral feedback from the instructor and students during laboratory classes	throughout the semester
3	Feedback in the form of a discussion of the final test	throughout the semester

The form of final control is differential credit.

The applicant is not allowed to take the final control of the practice (defense) if he missed and did not work more than 20% of the practice hours, did not complete the mandatory list of types of work, tasks (certain individual tasks) provided for by the working curriculum for this educational component, or has an unsatisfactory rating on the result (0–59 points).

EVALUATION BY EDUCATIONAL COMPONENT (ECTS EVALUATION SCALE)

On the ECTS scale	On the 100-point scale	On the national scale	Definition*
A	90-100	excellent	excellent – excellent performance with a small number of inaccuracies
B	82-89	good	very good – above average with a few minor errors
C	75-81		good – generally correctly performed work with a small number of errors
D	69-74	satisfactory	satisfactory – not bad, but with a significant number of shortcomings
E	60-68		sufficient – performance meets minimum criteria
FX	35-59	unsatisfactory with the possibility of reassembly	unsatisfactory – needs work before getting a positive rating
F	0-34	unsatisfactory with mandatory retake	unsatisfactory – serious further work with re-study of the course is necessary

6. EDUCATIONAL RESOURCES (LITERATURE)

6.1. Main sources

1. On waste management: Law of Ukraine dated 06/20/2022 No. 2320-IX (current version as of 2026). URL: Law of Ukraine "On waste management"
2. On environmental protection: Law of Ukraine dated 06/25/1991 No. 1264-XII (current version). URL: Law of Ukraine "On environmental protection"
3. Water Code of Ukraine dated 06/06/1995 No. 213/95-BP (current version). URL: Water Code of Ukraine
4. DSTU ISO 14001:2015. Environmental management systems. Requirements and guidelines for application. Kyiv: DP UkrNDNTs
5. Bublenko N. M. Calculations of the suitability of wastewater from food industry enterprises for biological treatment // Biota. Human. Technology. 2025. No. 2. URL: Article Biota
6. Beztelesna L. I., Butkevych V. O. Innovative development of food industry enterprises // Bulletin of the National University of Ukraine. 2023. No. 4(104). P. 75–86. URL: Repository of the National University of Ukraine
7. Strutynska L. R. Ecological efficiency of food and processing enterprises of small and medium-sized businesses // Bulletin of KhNTU. 2023. No. 1. URL: Article of KhNTU
8. Strutynska L. R. Creation of ecological enterprises of the food and processing industry in the territories of Western Ukraine // Bulletin of the Khmelnytsky National University. 2023. No. 2. URL: Article KhNU
9. Panko V. Analysis of environmental goals of sustainable development and their measurability among enterprises of the food industry of Ukraine // Scientific notes of the University "KROK". 2023. No. 72. P. 65–70. URL: Article KROK
10. Kupalova G., Demchenko K. The need and prerequisites for environmental modernization of production of business entities // Bulletin of KNU. Economics. 2023. No. 2. P. 84–92. URL: Article KNU
11. Mazur T., Korol E. Eco-industrial parks as a direction of innovative development of production territories // Spatial development. 2023. No. 6. P. 71–90. URL: Article KNUBA

6.2 Additional sources

12. Abdulla H. et al. An overview of agro-food industry wastewater treatment // Applied Water Science. 2023. Vol. 13. URL: Springer article
13. Abdel-Fatah M. A. Integrated management of industrial wastewater in the food sector // Sustainability. 2023. Vol. 15(23). URL: MDPI article
14. Ćirović N. Wastewater treatment in food industry // Conference Proceedings ACCHE. 2025. URL: ACCHE PDF
15. FAO, WHO. Guidelines for the Safe Use and Reuse of Water in Food Production and Processing. Rome, 2023. URL: FAO/WHO Guidelines PDF