

Ministry of Education and Science of Ukraine
Sumy National Agrarian University
Faculty of Food Technology
Department of Food Technology and Safety

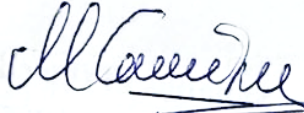
Work program (syllabus) of the educational component

MC 15 BIOCHEMISTRY

Specialty	G13 "Food Technologies"
Educational program	Food technology
Level of higher education	First (bachelor's)

Sumy - 2026

Developers:  Demidova E.V., Doctor of Philosophy, Associate Professor of the
Department of Food Technology and Safety
(last name, initials) (academic degree and title, position)

Reviewed, approved and ratified at the department meeting <u>technologies and food safety</u> (name of department)	protocol 17 of 19.05,2026
	Manager departments <u></u> <u>Marina SAMILYK</u> (signature) (last name, initials)

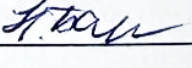
Agreed:

Guarantor of the educational program "Food Technologies"  Olena KOSHEL

Dean of the Faculty of Food Technology,
where the educational program is implemented  Nataliia BOLHOVA
(signature)

Review of the work program provided by:  Oksana MELNYK
(signature)

 V. TISCHENKO
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Methodologist of the Education Quality Department,
licensing and accreditation  Nadia Baranik
(signature) (Maria KOVALIOVA)
(First name LAST name)

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Information on reviewing the work program (syllabus):

Academic year in which changes are made	Number of the appendix to the work program with a description of the changes	Changes reviewed and approved		
		Date and number of the department meeting minutes	Head of the Department	Educational program guarantor

1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

Name OK	OK1 5 Biochemistry		
Status OK	Mandatory		
Program/Specialty(s) that include OK	" Food Technologies " / G 13 "Food Technologies"		
Name of structural unit	Faculty of Food Technology/Department of Food Technology and Safety		
NQF level	6th .		
Semester and study period	1st year, 2nd semester		
Number of ECTS credits	5		
Total hours and their distribution 150	Contact work (classes) full-time/part-time form of study		Independent work full-time/part-time form of study
	Lectures	Laboratory	
	30 /4	44 /10	
			76 /136
Language of instruction	Ukrainian		
Limitation	missing		
General description of the educational component	Studying the educational component contributes to the formation of a system of professional knowledge in higher education students on the basics of biochemistry of food systems, the regularities of biochemical processes in raw materials and food products, the mechanisms of enzymatic transformations and metabolic processes, which is the theoretical basis for mastering the technologies of production, storage and quality control of food products.		
Purpose of the educational component	The purpose of teaching is to form a system of knowledge about the chemical composition, structure, properties and transformations of biologically important substances in living organisms and food systems, as well as about biochemical processes that underlie the production, storage and quality and safety of food products. The discipline is aimed at students mastering the theoretical foundations of metabolism, enzymatic processes, mechanisms of biochemical changes in raw materials and finished products, necessary for solving professional tasks in the field of food technology.		
Prerequisites for studying OK, connection with other educational components of OP	1. The educational component is based on the Chemistry course. 2. The educational component is the basis for the OK "Theoretical foundations of food production", OK "Food control methods", OK "Technologies of grain, bread, pasta, confectionery and food concentrates". No restrictions		
Academic Integrity Policy	Provided in accordance with the Code of Academic Integrity (https://snau.edu.ua/viddil-zabezpechennya-yakosti-osviti/zabezpechennya-yakosti-osviti/akademichna-dobrochesnist/)		

Keywords	biochemistry, food technology, biologically active substances, enzymes, metabolism, proteins, lipids, carbohydrates, vitamins, enzymatic processes, biochemical transformations, food raw materials, food quality, food safety, metabolism, energy metabolism, biochemistry of nutrition.
Teacher information	Demydova Yevheniia Vyacheslavivna, Associate Professor of the Department of Food Technology and Safety, room 317m, +380507372890, E-mail: yevheniia.demydova@snaeu.edu.ua, consultations 14.30-15.45 every Monday
Link to the course in Moodle	https://cdn.snaeu.edu.ua/moodle/enroll/index.php?ID=850

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

Learning outcomes for OK: After studying the educational component, the student is expected to be able to...	Program learning outcomes that the OK aims to achieve				How is RND assessed?
	PRN5	PRN6	PRN18	PRN19	
DRN1. Determine the structure and biochemical properties of nutrients and predict the dynamics of nutrients and biologically active substances of food raw materials during the technological process.	+				Modular testing according to the schedule and assessment criteria. Performance and defense of laboratory work. Oral interview. Exam taking
DRN2. To establish the basic physicochemical and biochemical patterns of nutrient transformations during technological processing and to determine the main factors influencing the metabolism of proteins, lipids and carbohydrates of food products and their role in human nutrition.	+	+			
DRN3. Determine the qualitative and quantitative composition of food raw materials in specialized laboratories individually and/or as part of team groups.			+	+	

PRN5. Know the scientific foundations of technological processes in food production and the laws of physicochemical, biochemical and microbiological transformations of the main components of food raw materials during technological processing.

PRN6. Know and understand the main factors influencing the course of the synthesis and metabolism of food components and the role of nutrients in human nutrition.

PRN18. Have basic skills in conducting theoretical and/or experimental scientific research, performed individually and/or as part of a scientific group.

PRN19. Increase work efficiency by combining independent and team work.

3. CONTENT OF THE EDUCATIONAL COMPONENT (COURSE PROGRAM)

Topic. List of issues to be addressed within the topic	Distribution within the overall time budget		Recommend ed literature	
	Classroom work*		Himself. work*	
	Luke	LR		
Module 1				
Lecture 1. Introduction. Food chemistry and human nutrition. 1. The problem of providing humanity with food. 2. Classification of modern food products. 3. Main areas of food chemistry.	2/-		-/2	[1] , [2] , [15] [1], [2], [3], [5], [6] , [7], [12]
Laboratory lesson 1. <i>Introduction with safety rules and work techniques in a biochemical laboratory.</i>		2/-	-/2	
Self-study questions 1. Basic provisions of state policy in the field of healthy nutrition.			4/4	
Lecture 2. General characteristics of proteins as chemical substances. 1. The specific role of proteins in vital phenomena. 2. The main functions of proteins. 3. hydrolysis of proteins, products of their hydrolytic decomposition.	2/2			
Laboratory lesson 2. <i>Color reactions to proteins and their breakdown products.</i>		4/2	-/2	[1], [2], [3], [5], [6] , [7]
Self-study questions 1. Elemental composition of proteins. 2. Colloidal state of proteins. 3. Proteins are amphoteric electrolytes.			6/6	[1] , [3], [4], [5]
Lecture 3. Amino acids as the main structural components of protein molecules. 1. Amino acids as the main structural components of protein molecules, their classification and structure. 2. Functional groups of amino acids and their significance for protein structure. 3. Characteristics of the nutritional value of food products based on the composition of protein substances.	2/-		-/2	[1], [2], [3], [4], [5], [6], [7],
Laboratory lesson 3. <i>Study of the physicochemical properties of proteins.</i>		4/-	-/4	
Self-study questions 1. Biological role of individual amino acids. 2. Modern methods of isolation and identification of amino acids.			4/4	

Topic. List of issues to be addressed within the topic	Distribution within the overall time budget			Recommend ed literature
	Classroom work*		Himself. work*	
	Luke	LR		
Lecture 4. Classification and characterization of proteins. 1. Structure and structural organization of proteins. 2. Classification of proteins. 3. Biological value of proteins. 4. Characteristics of proteins in food raw materials.	2/-		-/2	[1], [2], [3], [5], [6], [7]
Laboratory lesson 4. <i>Determination of components of complex proteins using qualitative reactions.</i>		4/-	-/4	[1], [3], [4], [5]
Laboratory lesson 5. <i>Determining the biological value of proteins.</i>		2/2		
Self-study questions 1. Proteinoids (scleroproteins) – collagen, keratin, elastin, fibroin. 2. proteins: nucleoproteins, chromoproteins, phosphoproteins, lipoproteins.			6/6	[1], [2] ,
Lecture 5. Enzymes as natural protein catalysts. 1. The concept of enzymes as protein substances with catalytic properties. 2. Structure of enzymes. 3. Principles of classification and nomenclature of enzymes.	2		-/2	[1], [2], [3], [5], [6], [7]
Laboratory lesson 6. <i>Determination of enzyme specificity.</i>		2/2		[1], [3], [4], [5]
Self-study questions 1. Coenzymes: lipoic acid, coenzyme A (CoA), glutathione, ubiquinones, 2-oxoglutarate, tetrahydrofolic acid, B ₁₂ - dependent coenzymes. 2. Prosthetic groups of enzymes: thiamine phosphates, pyridoxal phosphate and pyridoxamine phosphate, biotin, iron porphyrin complexes.			6/6	[1], [2] , [20]
Lecture 6. Factors influencing enzyme activity. 1. General properties of enzymes. Factors influencing enzyme activity: pH, temperature, inhibitors and activators . 2. Principle of determining activity, units of enzyme activity . 3. Application of enzymes in food technology .	2		-/2	[1], [2], [3], [5], [6], [7]
Laboratory lesson 7. <i>The effect of pH on enzyme activity.</i>		2	-/2	[1], [3],
Laboratory lesson 8. <i>The effect of temperature on the rate of enzymatic reactions.</i>		2	-/2	[4], [5]
Self-study questions 1. Immobilized enzymes. 2. Enzymatic methods of food analysis.			4/4	[1] , [2]

Topic. List of issues to be addressed within the topic	Distribution within the overall time budget			Recommend ed literature
	Classroom work*		Himself. work*	
	Luke	LR		
Lecture 7. Chemistry of nucleic acids. 1. THE ROLE of nucleic acids in a living organism. 2. Types of nucleic acids, their chemical composition. 3. purine and pyrimidine bases, nucleosides and nucleotides.	2		-/2	[1], [2], [3], [4], [5], [6], [7]
Laboratory lesson 9. Isolation of DNA from plant materials.		2	-/2	[1], [3], [4], [5]
Self-study questions 1. Chargaf's rules. 2. The state of nucleic acids in the cell. 3. Gene biochemistry and transmission of genetic information.			6/6	[1], [2], [3], [5], [6], [7],
Total for module 1	14/2	24/6	36/66	
Module 2				
Lecture 8. General characteristics of the chemical nature and biological role of carbohydrates. 1. General characteristics of the chemical nature and biological role of carbohydrates. 2. Classification of carbohydrates. 3. The role of trioses and pentoses in a living organism.	2/2			[1], [2], [3], [4], [5], [6], [7]
Laboratory lesson 10. Qualitative reactions to mono- and disaccharides.		2/2		[1], [3], [4], [5] , [6]
Self-study questions 1. Characteristics of tetrosis. 2. General characteristics of pentoses of plant origin: arabinose, ribose, deoxyribose, xylulose.			6/6	[5], [6], [7]
Lecture 9. Chemistry of the main groups of carbohydrates. 1. Basic hexoses. 2. ABOUT oligosaccharides, their structure. 3. Polysaccharides, their structure, classification.	2/-		-/2	[1], [2], [3], [4], [5], [6], [7]
Laboratory lesson 11. Identification of reducing carbohydrates.		2/-	-/2	[1], [3],
Self-study questions 1. General characteristics of special carbohydrates. 2. Application of polysaccharides in the food industry.			6/6	[4], [5] , [6]
Lecture 10. Biological role and general characteristics of lipids. 1. General properties of lipids, their functions in a living organism. 2. Fats, their structure and properties. 3. Classification of lipids.	2/-		-/2	[1], [2], [3], [5], [6], [7]
Laboratory lesson 12. Determination of the emulsifying properties of lipids.		2/2		[1], [3], [4], [5] , [6]
Topic. List of issues to be addressed within the topic	Distribution within the overall time budget			Recommend ed literature
	Classroom work*		Himself. work*	
	Luke	LR		

Self-study questions 1. SATURATED carboxylic acids. 2. Unsaturated carboxylic acids. 3. Waxes – beeswax, lanolin, spermaceti, vegetable waxes.			4/4	
Lecture 11. Properties of basic lipids . 1. BIOLOGICAL significance of unsaturated fatty acids. 2. Features of the composition and properties of animal fats. 3. Fat constants .	2/-		-/2	[1], [7], [8], [9] , [11]
Laboratory lesson 13. Determination of acid and iodine values of edible fats .		2/-	-/2	[1], [4], [7], [8], [9] , [11]
Laboratory lesson 14. Determination of peroxide value of edible fats.		2/-	-/2	
Self-study questions 1. Glycerol phosphatides: lecithins, cephalins, serine phosphatides, acetal phosphatides, inositol phosphatides. 3. Sphingosine phosphatides.			4/4	[1], [3], [5] , [6]
Lecture 12. Chemistry of vitamins. 1. The role of vitamins in the life of humans and animals. 2. General characteristics of vitamins. 3. Classification and nomenclature of vitamins .	2/-		-/2	[1], [2], [3], [4], [5], [7]
Laboratory lesson 15. Determination of fat-soluble vitamins using qualitative reactions .		2/-	-/2	
Self-study questions 1. Structure and physicochemical properties of lipotropic factors: choline, carnitine, lipoic acid. 2. Structure and physicochemical properties of bioflavonoids.			6/6	
Lecture 13. Characteristics of individual groups of vitamins. 1. General characteristics of water-soluble vitamins. 2. General characteristics of fat-soluble vitamins .	2/-		-/2	
Laboratory lesson 16. Determination of water-soluble vitamins using qualitative reactions.		2/-	-/2	
Self-study questions 1. Structure and physicochemical properties and biological role of para-aminobenzoic acid. 2. Structure and physicochemical properties and biological role of vitamin U.			4/4	
Lecture 14. Chemistry of minerals. 1. General characteristics of macro- and microelements. Biological role. 2. Classification of minerals according to their physiological effects on the body. 3. Characteristics of individual macro- and micronutrients.	2/-		-/2	[1], [7], [10]
Laboratory lesson 1 7. Quantitative determination of mineral elements in food products by the dry ashing method .		2/-	-/2	[1], [7], [10]
Self-study questions 1. Changes in the content of mineral substances during the technological processing of food raw materials.			4/4	[1], [7]
Lecture 15. Biochemical changes in basic substances during storage and technological processing of food products. 1. Condition and water content. 2. Changes in the state and content of proteins.	2/-		-/2	[1], [2], [3], [7],

Laboratory lesson 18. <i>Determination of the mass fraction of moisture and ash in food products</i>		4/-	-/4	[8]
Self-study questions 1. Biochemical changes in lipids during storage and technological processing of food products. 2. Biochemical changes in carbohydrates during storage and technological processing of food products. 3. Changes in vitamins during storage and technological processing of food products.			6/6	[1], [7]
Total per module	16/2	20/4	40/70	
Total per course	30/4	44/10	76/136	

* full-time/part-time form of study

4. TEACHING AND LEARNING METHODS

DRN	Teaching methods	Number of hours*	Teaching methods	Number of hours*
DRN1. Determine the structure and biochemical properties of nutrients and predict the dynamics of nutrients and biologically active substances of food raw materials during the technological process.	Lecture presentations with demonstrations of diagrams, models and the use of interactive technologies.	30/4	Processing lecture notes and teaching materials.	76/136
DRN2. To establish the basic physicochemical and biochemical patterns of nutrient transformations during technological processing.	Laboratory classes with an explanation of methods for determining biochemical indicators of food raw materials and products, research into the influence of technological factors on the course of biochemical processes	44/10	Performing and defending laboratory work.	
DRN3. Identify the main factors influencing the metabolism of proteins, lipids, and carbohydrates in food products and their role in human nutrition.			Completion of test tasks and situational exercises.	
			Independent analysis of biochemical processes in food systems.	

* full-time/part-time form of study

5. EVALUATION BY EDUCATIONAL COMPONENT

5.1. Summative assessment

5.1.1. To assess the expected learning outcomes, there are

No.	Summative assessment methods	Points / Weight in the overall score	Date of compilation
Module 1 (35 points)			
1.	Intermediate testing "Module 1" (multiple choice test)	17 points / 17%	Week 7
2.	Laboratory work defense (9 LRs, 2 points each)	18 points/18%	within 5 days after class
Module 2 (35 points)			
3.	Intermediate testing "Module 2" (multiple choice test)	17 points / 17%	Week 15
4.	Laboratory work defense (9 LRs, 2 points each)	18 points / 18%	within 5 days after class
5.	Taking the exam	30 points / 30%	according to the educational process schedule

5.1.2. Evaluation criteria

Component	Evaluation
Laboratory work protection	<i>Each completed laboratory work is valued at 2 points.</i>
Midterm testing (multiple choice test)	<i>The test includes 17 questions, each of which is worth 1 point.</i>
Exam (multiple choice test)	<i>The test includes 30 questions, each of which is worth 1 point.</i>

5.2. Formative assessment:

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

No.	Elements of formative assessment	Date
1	Oral survey after studying all topics, during laboratory classes	during laboratory work
2	Feedback in the form of a discussion of testing "Module 1"	Week 7
3	Feedback in the form of a discussion of testing "Module 2"	Week 15
4	Feedback in the form of a discussion of exam results	according to the educational process schedule

The form of final control is ***an exam***. The final number of points in the discipline (maximum 100 points per semester) is determined as the sum of the points based on the results of the applicant's work during the semester.

A student is not allowed to take the final examination in a discipline if he/she has missed and has not completed more than 20% of classes, has not completed the modular control stages, has not completed the mandatory list of types of work provided for in the working curriculum for the semester in this academic discipline, or has an unsatisfactory rating at the end of the semester (0–34 points).

LEARNING RESOURCES (LITERATURE)

5.3. Main sources

1. Laboratory practical course in biochemistry: methodological recommendations for laboratory work for higher education students of the educational program Food Technologies / Bozhko N.V. - Sumy: Sumy National Agrarian University. 2025. - 146 p.
2. Carbohydrate metabolism: lecture notes / compilers: N. V. Bozhko, I. V. Chorna. – Sumy: Sumy State University, 2022. – 89 p.
3. Gelikh A. O. Biochemistry. Lecture notes. Sumy, 2023. 105 p.
4. Biological chemistry: textbook / L. F. Pavlotska, N. V. Dudenko, Levitin E. I. Sumy: University Book, 2023. 510 p. Grif MES.
5. Bioorganic chemistry: teaching and methodological manual./compiled by Rizak G.V. Uzhgorod: FOP Sabov A.M., 2024. 667 p.

6.2. Additional sources

6. Pasichnyi, V., Tischenko, V., Bozhko, N., Marynin, A., Moskaluyk, O., Geredchuk, A. Determining the medical and biological safety of meat-containing polycomponent products based on regional raw materials. Eastern-European Journal of Enterprise Technologies, 2022. Vol. 6 (11(120)), 126-133. <https://doi.org/10.15587/1729-4061.2022.268907>
7. Sukhodub, L., Bozhko, N., Kumeda, M., & Sukhodub, L. (2024). Antioxidant Potential of Quercetin and Rosemary Extract as Components of Nanometric Apatite Biopolymer Materials for Osteoplasty. Journal of Drug Delivery Science and Technology , 105870.
8. Coulter, T. (2023). Food: the chemistry of its components. Royal Society of Chemistry. 528 pages .
9. Pruteanu, LL, Bailey, DS, Grădinaru, AC, & Jäntschi, L. (2023). The biochemistry and effectiveness of antioxidants in food, fruits, and marine algae. Antioxidants , 12(4), 860.
10. Sereda, O., Demydova, Y., Koshel, O., Ponomarenko, V., Voronin, O., Kuznietsova, I., & Zaichuk, L. (2025). Assessment of the content of flavonoids in green buckwheat flour. *Technology Audit and Production Reserves* , 5 (3(85)), 29–34. <https://doi.org/10.15587/2706-5448.2025.341092>
11. Guba S. O., Bolgova N. V., Demydova E. V., Guba O. O. Development of a mixture recipe for a protein cocktail with increased biological value. *Technical Sciences and Technologies*. 2025. No. 1(39). P. 255-265.
12. Puryhin, I., Nazarenko, Y., Synenko, T., Bolhova, N., & Demydova, Y. (2025). Determining the effect of nanofiltration on the nutritional and biological value of whey. Eastern-European Journal of Enterprise Technologies, 5(11 (137)), 71–78. <https://doi.org/10.15587/1729-4061.2025.339914>