

Ministry of Education and Science of Ukraine  
Sumy National Agrarian University  
Faculty of Engineering and Technology  
Technology of Nutrition Department

**Work program (syllabus) of the educational component**

**SC Low-temperature and extrusion technologies**

Selective

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(name and status (required / optional))

It is implemented within the educational program

**"Food technologies"**

by specialty 181 "Food technologies"

at the second (master's) level of higher education

Sumy - 2022

Developer Melnyk **Melnyk O.Y., Ph.D., associate professor**  
(signature) (surname, initials) (degree and title, position)  
Bokovets **Bokovets S.P., assistant**  
(signature) (surname, initials) (degree and title, position)  
Sereda **Sereda O.H., assistant**  
(signature) (surname, initials) (degree and title, position)

Considered, approved and approved on meetings of Technology of Nutrition department  (name of department)	protocol from <u>14.06.2022.No 18</u>
	Acting head of the department <u>Melnyk</u> (signature) <u>Melnyk O.Y.</u> (surname, initials)

Agreed:

Guarantor of the educational program Pertsevoi **Pertsevoi F.V.**  
(signature) (surname)

Acting Deputy Dean, where the educational program is implemented  
Bolhova **Bolhova N.V.**  
(signature) (full name)

Review of the work program (attached) provided by: Bolhova **Bolhova N.V.**  
(surname)  
Stepanova **Stepanova T.M.**  
(surname)

Methodist of the Education Quality Department,  
licensing and accreditation N. Baranik **(N. Baranik)**  
(signature) (surname)

Registered in the electronic database: date: 05.07 2022

## 1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

1.	The name is OK	Low-temperature and extrusion technologies							
2.	Faculty/department	Food technologies / Department of food technologies							
3.	The status is OK	Selective							
4.	Program/Specialty (programs), the component of which is OK for (to be filled in for <i>mandatory OK</i> )	Educational program: Food technologies/ specialty: 181 "Food technologies"							
5.	It can be OK proposed for (to be completed for selective OKs)	-							
6.	NRK level	Level 7							
7.	Semester and duration Study	Third semester The duration of study is 1 semester							
8.	Number of credits ECTS	5 credits							
9.	The total number of hours and their distribution	Contact work (class)					Individual work		
		Lectures		Practical /seminars		Laboratory			
		Denna	Preschool	Denna	Preschool	Denna	Preschool	Denna	Preschool
		12		-	-	60		78	
	The amount of hours and their distribution, taking into account the choice of students	4				10		136	
10.	Language of education	Ukrainian, English							
11.	Teacher/Coordinator educational component	Melnyk Oksana Yuriivna							
11.1	Contact Information	The auditorium of the department is 220 m, building No. 4. Tel. 096-432-80-72, E-mail: oxana7@i.ua consultation time: Wednesday from 12 to 1 pm							
12.	General description educational component	Training of future specialists who are familiar with the basic laws of low-temperature and extrusion technologies, requirements for raw materials, the main parameters of freezing and extrusion, equipment for ensuring these processes and the influence of freezing, defrosting and extrusion processes on the quality of finished products.							
thirteen.	The purpose of educational component	The student acquires knowledge about the essence of low-temperature and extrusion technologies, the flow of processes in these technologies, requirements for raw materials and food additives used to obtain high-quality products, parameters of technological processes, equipment, and packaging materials.							
14.	Prerequisites for studying OK, connection with other educational ones OP components	The educational component is connected with other educational components "General technologies of the food industry", "Quality management of food production", "Innovative engineering"							
15.	Academic policy integrity	If the fact of writing off is discovered during the exam, the student's work is canceled and the exam is retaken.							
16.	Link to the course at the Moodle system	<a href="https://cdn.snau.edu.ua/moodle/enrol/index.php?id=5125">https://cdn.snau.edu.ua/moodle/enrol/index.php?id=5125</a>							

**2. LEARNING RESULTS UNDER THE EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP WITH PROGRAM LEARNING OUTCOMES**

Learning outcomes of the discipline <sup>1</sup>	Program learning outcomes <sup>2</sup>				How is the learning outcome of the discipline assessed
	PLO 5	PLO 7	PLO 9	PLO 14	
<u>LOD 1.</u> Knowledge of the current state and prospects for the introduction of low-temperature and extrusion technologies in the food industry; requirements for the quality of raw materials, food additives to ensure the quality of finished products.	x	x			<i>Assessment of knowledge by checking the processing of the reference outline of lectures and laboratory sessions</i>  <i>Examination</i>  <i>Computer testing (certification)</i>
<u>LOD 2.</u> Knowledge of innovative methods of processing raw materials; the main types of equipment used in low-temperature and extrusion technologies.	x				
<u>LOD 3.</u> Knowledge of the features of low-temperature technologies under the condition of freezing semi-finished products at various stages of the technological process; basic principles of high-temperature extrusion; changes that occur with the components of raw materials in the process of freezing and extrusion processing.		x		x	
<u>LOD 4.</u> Knowledge of waste-free technologies and new ways of canning and storing food products; principle and equipment-technological schemes of production of products of low-temperature and extrusion technologies, technological regimes and methods of their regulation.	x			x	
<u>LOD 5.</u> The ability to logically formulate thoughts, present the results of practical activities, analyze and formalize the results of production tests in the form of reports, abstracts, protocols of laboratory work.			x		

### 3. CONTENTS OF THE EDUCATIONAL COMPONENT (COURSE PROGRAM)

Topic. List of upcoming questions considered within the topic	Distribution within the general time budget			Recommen- ded literature 5
	Auditory work		Self- secretwo rk	
	L	Lab		
<p><i>Topic 1. Introductory lecture. Basics of low-temperature technologies. Requirements for raw materials used in the technology of freezing semi-finished products</i></p> <p>Plan</p> <p>1. Low-temperature technology as a method of preserving semi-finished products and finished products.</p> <p>2. The purpose of freezing semi-finished products of various degrees of processing.</p> <p>3. The role of recipe components in the technology of freezing semi-finished products.</p> <p>4. Requirements for the quality of raw materials used for the production of frozen products.</p>	-	-	20	[1,3,6]
<p><i>Topic 2. Modern low-temperature technologies implemented in the bakery industry</i></p> <p>Plan</p> <p>1. Dough freezing technology for home baking.</p> <p>2. Technology of freezing the dough after dividing it into pieces.</p> <p>3. Technology of freezing the dough after forming.</p> <p>4. Technology of freezing dough semi-finished products after proofing.</p> <p>5. Technological parameters of the technological process in the case of freezing semi-finished products of various degrees of processing. Quality of products.</p> <p><i>Laboratory work No. 1-2 (12 hours)</i></p> <p><i>Study of the effect of freezing on the quality of frozen semi-finished products</i></p>	1	6	18	[3,6,7]
<p><i>Topic 3. Modern low-temperature technologies used in the confectionery industry</i></p> <p>Plan</p> <p>1. Dough freezing technology for home use.</p> <p>2. Technology of freezing semi-finished products (dough blanks for cakes, pastries, gingerbread).</p> <p>3. Technology of freezing semi-finished dessert products.</p> <p>4. Quality of products.</p>	1	-	18	[1,7]
<p><i>Topic 4. Modern low-temperature technologies for processing and long-term storage of fruits and vegetables</i></p> <p>Plan</p> <p>1. Requirements for the quality of raw materials.</p> <p>2. Technologies of low-temperature freezing, long-term storage, defrosting and processing of vegetable and fruit raw materials.</p> <p>3. Equipment used for freezing fruit and vegetable products.</p> <p>4. Technological processes of storing agricultural products in frozen form.</p>	1	-	20	[1,8]
<p><i>Topic 5. Extrusion is a modern way of obtaining breakfast cereals. Types of extruders</i></p> <p>Plan</p> <p>1. cold, thermal and high-temperature extrusion. Basic parameters of extrusion processing.</p> <p>2. Raw materials used in high-temperature extrusion processing.</p> <p>3. Construction and structure of the extruder.</p> <p>4. One thing twin screw extruders. Advantages and disadvantages.</p>		-	20	[2,4]
<p><i>Topic 6. Changes in the main components of grain raw materials during the extrusion process</i></p>		-	20	[4,5]

Plan 1. Protein denaturation. Reducing the number of water- and salt-soluble fractions. Amino acid changes. 2. Decarboxylation and deamination reactions. 3. Changes in the carbohydrate complex. Features of pasteurization of starch. Changes in amylopectin, amylose, di- and monosaccharides. 4. Melonoid formation reaction. 5. Reducing the amount of vitamins, fats, unsaturated fatty acids, inhibitors of proteolytic enzymes.				
<i>Topic 7. Production of extruded products and the influence of variable extrusion parameters on the main indicators of finished products</i> Plan 1. Peculiarities of the coextrusion process. 2. Production of extruded potato products and modified extruded starch. 3. Effect of temperature in the extruder before the matrix on the coefficient of swelling of various grains. 4. The influence of the main factors on the coefficient of swelling. 5. The influence of the fractional composition of grain raw materials on quality indicators of finished products. <i>Laboratory work No. 3</i> <i>Study of the influence of extrusion parameters on the indicators of finished products</i>	1	4	20	[2,4,5]
<b>In total</b>	<b>4</b>	<b>10</b>	<b>136</b>	

#### 4. TEACHING AND LEARNING METHODS

Learning outcomes of the discipline	Teaching methods (work to be done by the teacher during classes, consultations)	Number of hours	Teaching methods (what types of educational activities the student must performing dependently)	Number of hours
<u>LOD 1.</u> Knowledge of the current state and prospects for the introduction of low-temperature and extrusion technologies in the food industry; requirements for the quality of raw materials, food additives to ensure the quality of finished products.	Lecture session (teaching of lecture material, conversation, demonstration of graphic material)	1	Acquaintance with the lecture material, drawing up a reference synopsis of the lectures. Presentation of decisions and preparation of abstracts, reports with visual support	30
<u>LOD 2.</u> Knowledge of innovative methods of processing raw materials; the main types of equipment used in low-temperature and extrusion technologies.	Laboratory session (consideration of technological situations with the provision of recommendations for solving technological problems of production)	4	Presentation of the results of laboratory classes, preparation of reports	30
<u>LOD 3.</u> Knowledge of the features of low-temperature technologies under the condition of freezing semi-finished products at various stages of the technological process; basic principles of high-temperature extrusion; changes that occur with the components of raw materials in the process of freezing and extrusion processing.	Laboratory session (consideration of technological situations with the provision of recommendations for solving technological problems of production)	4	Presentation of the results of laboratory classes, preparation of reports	30

LOD 4, Knowledge of waste-free technologies and new ways of canning and storing food products; principle and equipment-technological schemes of production of products of low-temperature and extrusion technologies, technological regimes and methods of their regulation.	Lecture session (teaching of lecture material, conversation, demonstration of graphic material)	1	Acquaintance with the lecture material, drawing up a reference synopsis of the lectures. Presentation of decisions and preparation of abstracts, reports with visual support	30
LOD 5, The ability to logically formulate thoughts, present the results of practical activities, analyze and formalize the results of production tests in the form of reports, abstracts, protocols of laboratory work.	Lecture session (teaching of lecture material, conversation, demonstration of graphic material) Laboratory session (consideration of technological situations with the provision of recommendations for solving technological problems of production)	4	Acquaintance with the lecture material, drawing up a reference synopsis of the lectures. Presentation of decisions and preparation of abstracts, reports with visual support	16

## 5. EVALUATION BY THE EDUCATIONAL COMPONENT

### 5.1. Summative assessment

5.1.1. To assess the expected learning outcomes, it is provided

No	Methods of summative assessment	Points / Weight in the overall assessment	Compilation date
1.	Written control work on the theoretical material	20 points / 20%	Until the end of the 15th week
2.	Performance and protection of laboratory work	20 points / 20%	Until the end of the 15th week
3.	Performing independent work. Public speech with visual accompaniment of the topic of the report (abstract)	15 points / 15%	Until the end of the 14th week
4.	Final certification is a multiple-choice test	15 points / 15%	By the end of the 8th week
5.	The exam is a written answer to the ticket	30 points / 30%	Until the end of the 15th week

### 5.1.2. Evaluation criteria

Component 8	Unsatisfactorily	Satisfactorily	Fine	Excellent <sup>9</sup>
1. Written control work on the theoretical material	<12 points Task requirements not met	12-15 Answers to all questions are given, but individual components of the answers are missing or insufficiently disclosed, there is no analysis of other approaches to the question	15-18 points All questions are answered	20 points All questions are answered, creativity, thoughtfulness is demonstrated, and an own solution to the problem is proposed
Performance and protection of	<12 points Task requirements	12-15 Answers to all	15-18 points All questions are	20 points All the

laboratory work	not met	questions are given, but individual components of the answers are missing or insufficiently disclosed, there is no analysis of other approaches to the question	answered	requirements of the task were met, creativity and thoughtfulness were demonstrated, and an own solution to the problem was proposed
Performing independent work	<8 points	8-11	11-14 points	15 points
	Task requirements not met	Answers to all questions are given, but individual components of the answers are missing or insufficiently disclosed, there is no analysis of other approaches to the question	All questions are answered	All the requirements of the task were met, creativity and thoughtfulness were demonstrated, and an own solution to the problem was proposed
Final certification is a multiple-choice test	<8 points	8-11	11-14 points	15 points
	Task requirements not met	Answers to all questions are given, but individual components of the answers are missing or insufficiently disclosed, there is no analysis of other approaches to the question	All questions are answered	All the requirements of the task were met, creativity and thoughtfulness were demonstrated, and an own solution to the problem was proposed
The exam is a written answer to the ticket	<12 points	12-24	25-29 points	30 points
	Task requirements not met	Answers to all questions are given, but individual components of the answers are missing or insufficiently disclosed, there is no analysis of other approaches to the question	All questions are answered	All the requirements of the task were met, creativity and thoughtfulness were demonstrated, and an own solution to the problem was proposed

### 5.2. Formative assessment:

To assess the current progress in learning and understand the directions for further improvement is provided

No	Elements of formative assessment	Date
<i>Autumn semester</i>		
1.	Written control of knowledge after studying topics 1-4	7 week
2.	Written control of knowledge after studying topics 5-8	14 week



3.	<i>Oral survey during each laboratory session</i>	<i>Within 1-14 weeks</i>
4.	<i>Feedback from the teacher during the preparation for certification</i>	<i>8 week</i>
5.	<i>Feedback from the teacher while working on the essay</i>	<i>14 week</i>
<b><i>Spring semester</i></b>		
1.	<i>Written control of knowledge after studying topics 9-10</i>	<i>7 week</i>
2.	<i>Written control of knowledge after studying topics 11-12</i>	<i>14 week</i>
3.	<i>Oral survey during each laboratory session</i>	<i>Within 1-14 weeks</i>
4.	<i>Feedback from the teacher during the preparation for certification</i>	<i>8 week</i>
5.	<i>Feedback from the teacher while working on the essay</i>	<i>14 week</i>

## 6. EDUCATIONAL RESOURCES (LITERATURE)

### 6.1. The main one

1. Domaretsky V.A., Shiyan P.L., Kalakura M.M., Romanenko L.F., Khomichak L.M., Vasylenko O.O., Melnyk I.V. Melnyk L.M., General technologies of food production: textbook. - K.: University "Ukraine", 2010. - 814 p.
2. Kalashnikov G.V., Ostrykov A.N. Resource-saving technologies of food concentrates. – Voronezh: 2004. – 355 p.
3. Regulatory support for the production of frozen cakes, pies and rolls / [Based on the materials of the report by N.A. Shcherbakova] // Food industry. – 2012. – No. 1(10). – pp. 35–36.
4. Ostrykov A.N., Abramov O.V., Rudometkin A.S. Extrusion in food technology. - S.Pb.: GIOR, 2006. - 228 p.
5. Sytnikov E.D. Workshop on technological equipment of canning and food concentrate production. - S.Pb.: GIOR, 2004. - 406 p.
6. Suvorov O.L., Labutina N.V. Defrosting partially baked semi-finished products // Bread products. - 2007. - No. 4. - P. 36-37.
7. Rogliev Y. Modern approaches to the technology of production of bakery products from frozen dough semi-finished products / Y. Rogliev, O. Shidlovska, T. Ishchenko // Bakery and confectionery industry of Ukraine. – 2011. – No. 11. – P. 7–12.