

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
SUMY NATIONAL AGRARIAN UNIVERSITY

Food Technology Department

«Approved by»

Head of Food Technology Department

25/06 2020

(F.V.Pertseviy)

PROGRAM OF THE EDUCATIONAL DISCIPLINE

MODERN INSTRUMENTAL RESEARCH METHODS

Specialty: 181 «*Food Technology*»  
Knowledge Area: 18 «*Manufacturing and Technology*»  
Qualification: *Doctor of Philosophy in branch «Manufacturing and Technology», in specialty «Food Technology»*  
Faculty: *Food Technology*

2020-2021 academic year

Program of the discipline «**Modern instrumental research methods**» for doctors of philosophy in the branch «**Manufacturing and Technology**», specialty 181 «**Food technology**»

Developers:


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The program is approved by the Food Technology Department.

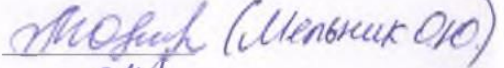
Minutes of “25” June 2020 № 16

Head of the Department

  
(signature) (F. Pertseviy)

**Agreed:**

Guarantor of the educational program

 (O.V. Radchuk)

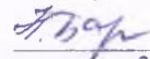
Dean of the Faculty of Food Technologies



(O.V. Radchuk)

Methodist of the Department of Education Quality,

Licensing and Accreditation



(N.M. Baranik)

Registered in the electronic database: date: 28. 08. 2020 p.

## 1. Description of the course

Name of indicators	Area of knowledge, direction of training, educational and qualification level	Characteristics of the course	
		full-time education	external form of education
Number of credits – 4	<b>Knowledge Area:</b> <i>18 «Manufacturing and Technology»</i>	<i>Selective</i>	
Modules – 2	<b>Specialty:</b> <i>181 «Food Technology»</i>	<b>Year training:</b>	
Content modules: 2		<b>2020-2021</b>	-
Individual research work: yes		<b>Course</b>	
		2	-
Total hours – 120		<b>Semester</b>	
		4	-
Number of weekly hours for full-time study: classroom – 2,7 independent work – 2,7	<b>Qualification:</b> <i>Doctor of Philosophy in branch «Manufacturing and Technology», in specialty «Food Technology»</i>	44 hours	-
		<b>Practical, seminar</b>	
		44 hours	-
		<b>Laboratory work</b>	
		-	-
		<b>Independent work</b>	
		32 hours	-
<b>Individual research work: yes</b>			
Type of control:		<b>- credit</b>	

### Note.

The ratio of hours of class to independent work is (%): 73.3 / 26.7 (88/32)

## 2. The aim and tasks of the course

**The aim:** To provide a holistic view of modern instrumental methods of research into indicators of quality of raw materials and finished products of restaurants and food businesses.

**The tasks:** acquisition of postgraduate students theoretical knowledge and practical skills on research of various indicators of quality and safety of food raw materials, semi-finished products and finished products, familiarization with foreign experience, new trends, modern laboratory equipment and requirements of the relevant the state standard of Ukraine.

*As a result of studying the discipline, the graduate student should:*

**to know:** research methodology, modern instrumental methods of research of food raw materials, semi-finished products and finished products, the latest world achievements and new trends in the field of food quality and safety research, the latest laboratory equipment used in advanced world laboratories, the principle of its work and technical capabilities, original methods of certain quality indicators, perspective directions of development of methods of food systems

research, the state standard of Ukraine requirements for quality of raw materials and finished products..

**be able to:** analytically and scientifically substantiate modern methods of research for a particular subject of study, organize, plan and implement scientific research to determine the quality and safety of food; apply the latest information technology, specialized software to analyze the results, draw appropriate conclusions, provide suggestions and recommendations.

### **3. The program of the course**

(Approved by the SNAU Methodological Council ... 2020, protocol No. ...)

#### **Content module 1. Fundamentals of modern food quality and safety control. Chemical, physical and physico-chemical control methods.**

**Topic 1. Fundamentals and methodology of food quality control.** General concepts of food quality and safety. Legal and technical basis of food quality control. Classification and general characterization of methods of research of food systems. Comprehensive assessment of quality and safety of food raw materials and products.

**Topic 2. Newest chemical, physical and physical-chemical research methods.** General characteristics of chemical, physical and physico-chemical indicators of food raw materials and products. Characterization of physical methods of investigation of composition and properties of food raw materials and products. Characterization of chemical methods of investigation of composition and properties of food raw materials and products. Characterization of physicochemical methods of investigation of composition and properties of food raw materials and products. Review of modern laboratory equipment for carrying out physical, chemical and physicochemical methods of analysis of food systems. Classification of equipment, its technical capabilities, principle of operation and procedure.

#### **Content module 2. Modern methods for determination of rheological, biochemical, microbiological parameters. Methods for determining nanostructures.**

**Topic 3. The newest rheological parameters research methods.** General characteristics of rheological indicators of food raw materials and products. Characterization of methods of research of rheological parameters. Overview of modern laboratory equipment for rheological methods of analysis of food systems. Food texture analyzers. Classification of equipment, its technical capabilities, principle of operation and procedure.

**Topic 4. Newest biochemical and microbiological parameters research methods.** General characteristics of biochemical and microbiological parameters. Characterization of research methods for biochemical and microbiological parameters. Review of modern laboratory equipment for biochemical and microbiological methods of analysis of food systems. Classification of equipment, its technical capabilities, principle of operation and procedure.

**Topic 5. Methods for determining nanostructures of food systems.** Development of nutritional materials through nanoscience. Nanoscale materials and structures of food materials, formation and application of nanocomposites and nanocolloids in food technology. Characterization of methods in food nanotechnology. Methods of nanostructures evaluation, characterization of research opportunities, advantages and disadvantages of methods. Scanning electron microscopy. Transmission electron microscopy. Dynamic light scattering. X-ray diffraction. Overview of modern laboratory equipment for the methods of determination of nanostructures of food systems. Classification of equipment, its technical capabilities, principle of operation and procedure.

#### 4. The structure of the course

Names of content modules and topics	Number of hours											
	Full-time						Correspondence form					
	Total	including					Total	including				
		Lectures	Practical work	Laboratory work	Individual research work	Independent work		Lectures	Practical work	Laboratory work	Individual research work	Independent work
<b>Module 1</b>												
<b>Content module 1. Fundamentals of modern food quality and safety control. Chemical, physical and physico-chemical control methods.</b>												
Topic 1. Fundamentals and methodology of food quality control.	22	8	8			6						
Topic 2. Newest chemical, physical and physical-chemical research methods.	34	12	12			10						
Together for Content Module 1	56	20	20			16						
<b>Module 2</b>												
<b>Content module 2. Modern methods for determination of rheological, biochemical, microbiological parameters. Methods for determining nanostructures.</b>												
Topic 3. The newest rheological parameters research methods.	20	8	8			4						
Topic 4. Newest biochemical and microbiological parameters research methods.	20	8	8			4						
Topic 5. Methods for determining nanostructures of food systems.	24	8	8			8						
Together for Content Module 2	64	24	24			16						
<b>Total hours in the course</b>	<b>120</b>	<b>44</b>	<b>44</b>			<b>32</b>						

#### 5. Topics and lectures plan

No	The name of the topic	Number of hours
1	<b>Topic 1. Fundamentals and methodology of food quality control.</b> 1. General concepts of food quality and safety. 2. Legal and technical basis of food quality control. 3. Classification and general characteristics of methods of research of food systems. 4. Comprehensive assessment of quality and safety of food raw materials and products.	8
2	<b>Topic 2. Newest chemical, physical and physical-chemical research methods.</b> 1. Characterization of physical methods of investigation of the composition and properties of food raw materials and products.	12

	<p>2. Characterization of chemical methods of investigation of the composition and properties of food raw materials and products.</p> <p>3. Characterization of physicochemical methods of investigation of composition and properties of food raw materials and products.</p> <p>4. Review of modern laboratory equipment for carrying out physical, chemical and physico-chemical methods of analysis of food systems.</p>	
3	<p><b>Topic 3. The newest research methods of rheological parameters.</b></p> <p>1. General characteristics of research methods of rheological parameters.</p> <p>2. Review of modern laboratory equipment for rheological methods of analysis of food systems.</p> <p>3. Food texture analyzers.</p>	8
4	<p><b>Topic 4. Newest research methods of biochemical and microbiological parameters.</b></p> <p>1. Characterization of research methods for biochemical and microbiological parameters.</p> <p>2. Review of modern laboratory equipment for conducting biochemical and microbiological methods of analysis of food systems.</p>	8
5	<p><b>Topic 5. Methods for determining nanostructures of food systems.</b></p> <p>1. Nanoscale materials and structures of food materials, formation and application of nanocomposites and nanocolloids in food technology.</p> <p>2. Characterization of methods in food nanotechnology.</p> <p>3. Methods of nanostructures evaluation, characterization of research opportunities, advantages and disadvantages of methods.</p> <p>4. Review of modern laboratory equipment for conducting methods for determining nanostructures of food systems.</p>	8
	<b>Total</b>	<b>44</b>

### 6. Practical topics

No	The name of the topic	Number of hours
1	Study of modern regulatory framework for quality control and safety of food raw materials and products	8
2	Study of methods and modern laboratory equipment for determination of physico-chemical parameters of food systems	12
3	Study of methods and modern laboratory equipment for determination of rheological indices of food systems	8
4	Study of methods and modern laboratory equipment for determination of biochemical and microbiological parameters	8
5	The study of methods and modern laboratory equipment for the determination of nanostructures of food systems	8
	<b>Total</b>	<b>44</b>

### 7. Independent work

No	The name of the topic	Number of hours
1	Fundamentals and methodology of food quality control.	6
2	Newest chemical, physical and physico-chemical research methods.	10
3	Newest research methods of rheological indicators.	4
4	Newest research methods of biochemical and microbiological parameters.	4
5	Methods for determining nanostructures of food systems.	8
	<b>Total</b>	<b>32</b>

## 8. Individual research work

1. Development of a block diagram of analytical and experimental work.
2. Modeling the composition and technology of new food products.
3. Analytical selection of methods of research into the quality and safety of new foods according to the predicted composition, technology and properties.
4. Review of promising methods for determining the quality and safety of new foods.
5. Selection of modern laboratory equipment for quality and safety studies.
6. Review of domestic scientific institutions, private laboratories offering services in determining the quality and safety of food raw materials and products.
7. Development of the author's methodology for determining a certain quality indicator (if necessary)

## 9. Learning methods

1. Learning methods for the source of knowledge:
  - 1.1. Verbal: work with a book, outline, production of tables, graphs, supporting notes, etc.).
  - 1.2. Visual: demonstration, observation.
  - 1.3. Practical: practical work.
2. Methods of learning by the nature of the logic of knowledge.
  - 2.1. Analytical
3. Methods of training for the nature and level of independent mental activity of graduate students.
  - 3.1. Problematic (problematic-informational)
4. Active teaching methods - the use of technical training tools, the use of problem situations, the use of training and control tests, the use of basic lecture notes.
5. Interactive learning technologies - use of multimedia technologies, interactive whiteboard and spreadsheets.

## 10. Control methods

1. Rating control over a 100-point ECTS rating scale
2. Conducting intermediate control during the semester
3. Multicriteria evaluation of graduate students' side work:
  - the level of knowledge demonstrated in laboratory classes;
  - activity during the discussion of the issues raised in the class;
  - results of laboratory work execution and protection;
  - self-study of the topic as a whole or individual issues;
  - test results;
  - written tasks in the course of control work.

## 11. The distribution of points received by the graduate students on the test

Ongoing testing and independent work					I W	Total for modules and IW	Attestation	Total
Content module 1 – 28 points		Content module 1 – 42 points						
T1	T2	T3	T4	T5	15	85 (70+15)	15	100
14	14	14	14	14				

**Evaluation scale: national and ECTS**

Total points for all types of educational activity	ECTS	An estimation by national scale
90-100	<b>A</b>	Excellent
82-89	<b>B</b>	Good
75-81	<b>C</b>	
69-74	<b>D</b>	Average
60-68	<b>E</b>	
35-59	<b>FX</b>	Bad with the opportunity to revise the course
1-34	<b>F</b>	Bad without the opportunity to revise the course

### 12. Methodological support

1. Методи контролю якості харчової продукції: навчальний посібник / О.І. Черевко, Л.М. Крайнюк, Л.О. Касілова та ін. // за заг.ред. Л.М. Крайнюк; ХДУХТ, СНАУ. – Суми: Університетська книга, 2012. – 512 с.
2. Фарзалиев Э.Б. Современные методы исследования пищевых продуктов. Методические указания. – Баку: Азербайджанский государственный экономический университет, 2012. – 75 с.
3. Базарнова Ю.Г. Теоретические основы методов исследования пищевых продуктов. Учеб. пособие. – СПб.: НИУ ИТМО; ИХиБТ, 2014. – 136 с.
4. ДСТУ 3021-95 «Випробування і контроль якості продукції. Терміни та визначення»
5. Діюча нормативна документація України (ДСТУ, ТУ У... тощо).
6. Закон України «О качестве и безопасности пищевых продуктов и продовольственного сырья» от 23.12.1997 г.
7. Закон Украины «О защите прав потребителей»
8. Закон Украины «О качестве и безопасности пищевых продуктов»
9. Закон Украины «О метрологии и метрологической деятельности» от 11.02.98 г.

### 13. Recommended literature

1. Dawson C. A practical guide to research methods: A user-friendly manual for mastering research techniques and projects. Third edition / Spring Hill House, United Kingdom, 2007. – 193 P.
2. Dawson C. Introduction to Research Methods: A Practical Guide for Anyone Undertaking a Research Project. 4 edition / Spring Hill House, United Kingdom, 2009. – 177 P.
3. Nanotechnology research methods for foods and bioproducts / edited by Graciela W. Padua, Qin Wang / Wiley-Blackwell, 2012. – 264 P.
4. Research Methodology in Food Sciences: Integrated Theory and Practice. 1st Edition / edited by C. O. Mohan, Elizabeth Carvajal-Millan, C. N. Ravishankar / Apple Academic Press, 2018. - 376 P.
5. Nanosensors for Smart Cities. 1st Edition / edited by Baoguo Han Vijay Tomer Tuan Anh Nguyen Ali Farmani Pradeep Kumar Singh / Elsevier, 2020. – 962 P.