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

Working program (syllabus) educational component

OK 11 MODERN INSTRUMENTAL RESEARCH METHODS

Mandatory
(name and status (required/optional)

Under implementation in within the educational programs
"Food Technologies"
by specialty **181 "Food Technologies"**

HED Doctor of Philosophy

Sumy – 2024

Developer: Igor Mazurenko, Professor of the Department of Food Technology, Doctor of Technical Sciences.

Considered, approved and approved on department meetingtechnology food			
	Manager departments	(signature)	**Oksana** MELNYK (name, initials)

Agreed:

Guarantor educational programs _____ Oksana MELNYK

(signature) (Full name)

Dean faculty,
where is being implemented educational program _____ Natalia BOLGOVA

(signature) (full name)

Review on working program (attached) provided by: Fedor PERTSEVOY (Full name)

Elena Koshel (Full name)

Methodist department qualities education,
licensing and accreditations _____ (_____)

(signature) (full name)

Registered in electronic base: date: _____2024 river

Information about revision working programs (syllabus):

Educational the year in which are introduced changes	Number application towork programwith description changes	Changes considered and approved		
		Date and number minutes of the meetingdepartments	Manager departments	Guarantor education al programs

1. GENERAL INFORMATION ABOUT EDUCATIONAL COMPONENT

<table>
<tr><td>1.</td><td>Name MC</td><td colspan="4">Modern instrumental research methods</td></tr>
<tr><td>2.</td><td>Faculty/department</td><td colspan="4">Food technologies/technologies food</td></tr>
<tr><td>3.</td><td>Status MC</td><td colspan="4">Mandatory</td></tr>
<tr><td>4.</td><td>Program/Specialty (programs), component whose there are MC for</td><td colspan="4">Third (educational and scientific) level of higher education in the specialty
181 "FOOD TECHNOLOGIES", branch of knowledge 18 "Production and Technologies" with a specialty of "Food Technologies"</td></tr>
<tr><td>5.</td><td>MC maybe be proposed for</td><td colspan="4">Specialty 181 "Food Technology"</td></tr>
<tr><td>6.</td><td>Level HED</td><td colspan="4">8 level</td></tr>
<tr><td>7.</td><td>Semester and duration study</td><td colspan="4">Second semester
Duration study – 15 weeks</td></tr>
<tr><td>8.</td><td>Number loans ECTS</td><td colspan="4">4 loans</td></tr>
<tr><td rowspan="2">9.</td><td rowspan="2">Total hours andtheir distribution (day form study/part-time training)</td><td colspan="3">Contact work (occupation)</td><td>Independent work</td></tr>
<tr><td>Lectures
20</td><td>Laboratory /seminar
--</td><td>Practical classes
20</td><td>50</td></tr>
<tr><td>10.</td><td>Language teaching</td><td colspan="4">Ukrainian</td></tr>
<tr><td>11.</td><td>Teacher/Coordinator educational component</td><td colspan="4">Teacher – professor departments technology food
Mazurekno Igor Kostiantynovych</td></tr>
<tr><td>11.1</td><td>Contact information</td><td colspan="4">Audience departments 212m, Email: 0487222489@ukr.net , oxana7@i.ua</td></tr>
<tr><td>12.</td><td>General description educational component</td><td colspan="4">The discipline is a component of scientific research in the food industry. It describes the methods used to obtain objective data on the physicochemical, organoleptic and biological properties of food products, as well as to analyze their composition and quality. In the modern food industry, various instrumental methods are used, including spectroscopy, mass spectrometry, chromatography, microscopy, nuclear magnetic resonance, electron microscopy and others. These methods allow to determine the composition of products, the content of nutrients, the presence of additives and contaminants, as well as to conduct research on their structure, physical and chemical properties. The use of modern instrumental research methods allows to improve the quality of food products, develop new production technologies, detect harmful substances and contaminants, control production processes and ensure food safety. These methods are an important tool for scientific research in the field of food technology and contribute to the development of innovations in the food industry.</td></tr>
<tr><td>13.</td><td>The purpose of education component</td><td colspan="4">Introducing candidates to advanced instrumental methods used for food research. This component aims to provide candidates with theoretical knowledge and practical skills in applying various analytical methods to study the qualitative and quantitative characteristics of food products.</td></tr>
<tr><td>14.</td><td>Study prerequisites OK, connection with others educational componentsOP</td><td colspan="4">The educational component has a connection with other educational components</td></tr>
</table>

		"Innovative technologies and optimization of technical and technological facilities of the processing industry", "Modern achievements of food science"
15.	Policy academic virtue	At discovered fact copying under time exam – work student is canceled and exam consists of repeatedly.

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

Results teaching for OK: After studying the educational component, the student is expected to be capable..."	Software results teaching, for achievement whose directed OK (specify number according to with the numbering given in OP)				As is being evaluated RND
	PRN 1	PRN 4	PRN 5	PRN 7	Implementation and protection practical work, testing, test
DRN 1. Publish your scientific results in scientific journals or present them at scientific conferences. Document and present research results in an appropriate format for further analysis and interpretation.	x				
DRN 2. Use spectroscopic, chromatographic, electrophoretic and other methods to determine the composition and properties of food materials. Develop experimental methods to solve specific research problems in the field of food technology.		x			
DRN 3. Use biochemical methods to analyze biological processes that occur in food products and raw materials.		x			
DRN 4. Know the methodology for conducting physicochemical, microbiological and biochemical research .			x		
DRN 5. Professionally use modern instrumental research methods to solve practical problems in the field of food technology. Perform critical analysis of scientific literature and integrate new methods and technologies into their research .				x	

3. CONTENT EDUCATIONAL COMPONENT (PROGRAM EDUCATIONAL DISCIPLINES)

Topic. List questions, What will be considered in within the topic	Distribution within general budgettime			Recommendationovate literature
	Auditorium work		Independent work	
	Luke	Pz		
Lecture 1. *Introductory – Generally accepted test methods and techniques, current regulatory documents for conducting research in the food and processing industry.* 1. Organization of scientific, technical and abstract information in various fields of science in Ukraine, the European Union and Asia; 2. Study of state regulatory documents (DSTU) on methods and techniques of conducting research. Research regulations, individual adaptation and implementation; 3. Conducting information searches, classifying patents and inventions, and their rational use. 4. Management of national and international regulatory framework **Practical lesson 1.** *Conducting information and analytical research on the established topic.* **Self-study** . Standardization and implementation: What mechanisms exist to ensure compliance with standards and the implementation of standardized research methods into industrial practice? What initiatives exist to spread awareness and train professionals in the field?	4	2	10	[1-1 4]
Lecture 2. *Conducting an experimental study* 1. General information about the experiment; 2. Development and construction of a laboratory setup; 3. Organization and conduct of experimental research; 4. Basic safety precautions when conducting an experiment. **Practical lesson 2.** *Determination of the object and methods of research, in accordance with the established topic of the dissertation.* **Independent study** . Interpretation of results: What conclusions can be drawn from the data obtained? What practical or theoretical implications do these results have for the field of study?	4	2	10	[1-1 4]
Lecture 3. *Instrumental physicochemical research methods.* 1. Refractometric analysis method; 2. Photocolorimetric analysis method; 3. Luminescent analysis method; 4. Potentiometric analysis method; 5. Conductometric analysis method; 6. Chromatographic method of analysis; **Practical lesson 3 .** *Physico-chemical research. Determination of optimally pleasant methods and techniques.* **Practical lesson 4.** *Preparation and conduct of physicochemical research.*	4	8	10	[1-1 4]

Self-study. Nuclear magnetic resonance spectroscopy. Infrared (IR) and ultraviolet (UV) spectroscopy.				
Lecture 4. *Biochemical, microbiological and immunological research methods.* 1. Biochemical research methods; 2. Microbiological research methods; 3. Molecular research methods; 4. Immunological research methods; 5. Express analysis methods; **Practical lesson 5.** *Microbiological research. Determination of optimally pleasant methods and techniques* **Practical lesson 6.** *Preparation and conduct of microbiological research.* **Independent study.** Fluorescence and luminescence spectroscopy. Determination of species and strains of bacteria and fungi using cultural and molecular genetic methods.	4	4	10	[1-1 4]
Lecture 5. *Presentation of research results.* 1. Determination of experimental error. Error. Student's coefficient. Detection of gross errors. Romanovsky's criterion; 2. Using mathematical modeling to process experimental data; 3. Application of graphical data interpretation; 4. General information; **Practical lesson 7 .** *Mathematical modeling, processing of experimental results, preparation of a scientific report.* **Independent study.** Ethical aspects: Taking into account ethical principles when designing and publishing research results, including maintaining data confidentiality and respecting the rights and dignity of all research participants.	4	4	10	[1-1 4]
Total	**20**	**20**	**50**	

4. METHODS TEACHING AND TEACHING

DRN	**Methods teaching** (work that will be carried out teacher duringclassroom classes , consultations)	**Number of hours**	**Teaching methods** (which types of training activities must be performedgetter independently)	**Number hours**
DRN 1. Publish their scientific results in scientific journals or present them at scientific conferences. Document and present research results in an appropriate format for further analysis and interpretation.	Lecture session (teaching lecture material, discussion, demonstration of graphic material) Practical session (demonstration and practical use of instrumental equipment, study of sample preparation methods, analysis and interpretation of results, solving practical problems)	8	Familiarization with the lecture material before the lecture, studying the material for independent study, as well as completing practical work tasks initiated during practical classes, completing an individual task	10
DRN 2. Use spectroscopic, chromatographic, electrophoretic and other methods to determine the composition and properties of food materials. Develop experimental methods to solve specific research problems in the field of food technology.		8		10
DRN 3. Use biochemical methods to analyze biological processes that occur in food products and raw materials.		8		10
DRN 4. Know the methodology for conducting physicochemical, microbiological and biochemical studies.		8		10
DRN 5. Professionally use modern instrumental research methods to solve practical problems in the field of food technology. Conduct critical analysis of scientific literature and integrate new methods and technologies into their research.		8		10

5. EVALUATION BY EDUCATIONAL COMPONENT

5.1. Diagnostic assessment (indicated as appropriate)

5.2. Summative assessment

5.2.1. For the assessment of expected learning outcomes, the following is provided:

No.	Summative assessment methods	Points / Weight in the	Date of compilation

		overall score	
Module 1 (50 points):			
1	Practical work (3 PZ, 7 points each)	*21 points / 21%*	according to the educational process schedule
2	Completing an individual task	*9 points / 9%*	Week 6
3	Midterm testing (multiple choice test)	*20 points / 20%*	Week 7
Module 2 (50 points):			
4	Laboratory work (4 PZ of 5 points each)	*20 points / 20%*	according to the educational process schedule
5	Completing an individual task	*10 points / 10%*	Week 13
6	Midterm testing (multiple choice test)	*20 points / 20%*	14 week

5.2.2. Evaluation criteria

Component	**Unsatisfactorily**	**Satisfactorily**	**Good**	**Perfectly**
Practical work (module 1)	3	4	6	7
	The student completed the practical work, but did not defend it.	Most requirements are met, but some components are missing	All task requirements met	All requirements of the task have been met, and an alternative solution has been proposed and substantiated.
Completing an individual task	2	5	8	9
	The student submitted the assignment but did not defend it.	Most requirements are met, but some components are missing	All task requirements met	All requirements of the task have been met, the result obtained is positive, and the importance of the research is justified.
Practical work (module 2)	2	3	4	5
	The student completed the laboratory work, but did not defend it.	Most requirements are met, but some components are missing	All task requirements met	All requirements of the task have been met, and an alternative solution has been proposed and substantiated.
Midterm testing (multiple choice test)	The test includes 20 questions, the correct answer to the test question is valued at 1 point.			

5.3. 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 practical classes	In practical classes
2	Feedback in the form of a discussion of the final testing	7, 14 weeks

3	Feedback in the form of a discussion after completing an individual task	Week 6, 13

6. EDUCATIONAL RESOURCE (LITERATURE)

Main

1. Catalog of regulatory documents of Ukraine URL: http://csm.kiev.ua/nd/nd.php
2. State Enterprise "UKRAINIAN INSTITUTE OF INTELLECTUAL PROPERTY" (Ukrpatent), Databases and information and reference systems URL: https://ukrpatent.org/uk/articles/bases2
3. Moskalenko O. V., Tsygankov S. A. Food Chemistry: Textbook. Nizhyn: Mykola Gogol National State University, 2022. 158 p.
4. Kichkyruk O.Yu., Shlyanina A.V., Kusyak N.V.A64 Analytical chemistry: textbook / Kichkyruk O.Yu., Shlyanina A.V., Kusyak N.V. – Zhytomyr: Publishing house of Ivan Franko State University, 2022. – 242 p.
5. Food technologies. Part 1. Innovations in the food industry: a textbook for graduate students / O.Yu. Melnyk, M.Yu. Savchenko-Pererva, T.M. Stepanova and others. ; ed. O.Yu. Melnyk. - Odesa: Oldi+, 2024. - 145 p.
6. Methodology of scientific research: a textbook for students and postgraduates of specialty 181 “Food technologies” / Ladyka V. I., Shilman L. Z., Pertsevoy F. V. et al. / edited by Ladyka V. I. – Kherson: OLDI-PLUS, 2021. – 222 p.
7. DSTU ISO 3696:2003 Water for use in laboratories. Requirements and verification methods (ISO 3696:1987, IDT) URL access mode: http://online.budstandart.com/ru/catalog/doc-page?id_doc=58881
8. Modern achievements of food science: a textbook for students and postgraduates of specialty 181 “Food technologies”: In 2 parts. Part 2 / Ladyka V. I., Shilman L. Z., Pertsevoy F. V. and others / edited by Ladyka V. I. – Kherson: Oldi+, 2022. – 352 p.
9. DSTU 5093:2008. Canned foods. Preparation of solutions of reagents, dyes, indicators and nutrient media used in microbiological analysis. URL: https://online.budstandart.com/ua/catalog/doc-page.html?id_doc=105374
10. DSTU 7040:2009. Fruits, vegetables and their processed products, canned meat and meat-vegetable products. Preparation of samples for laboratory analysis. – Kyiv: Derzhspozhyvstandart of Ukraine, 2010. 18 p.
11. DSTU 7670:2014 Raw materials and food products. Sample preparation. Mineralization for determining the content of toxic elements. URL: http://online.budstandart.com/ua/catalog/doc-page?id_doc=85544
12. DSTU 8051:2015 Food products. Sampling methods for microbiological analyses. URL: http://online.budstandart.com/ua/catalog/doc-page?id_doc=81137
13. DSTU 8448:2015 Canned food products. Sampling and preparation for testing. URL http:// online.budstandart.com/ua/catalog/doc-page?id_doc=71574
14. MBT and SN No. 5061–89 Medical and biological requirements and sanitary standards for the quality of food raw materials and food products. [Electronic resource] // Government portal. The only web portal of executive authorities of Ukraine. URL: http://www.moz.gov.ua.

Auxiliary

1. Mazurenko I., Shao Zhengzheng, Yangui Xie The plant raw materials and medicinal plants for children's functional foods, safety studies, Collection. of scientific works Tavrichesky State agrotechnological University named after Dmitry Motorny. Issue 23, Vol. 1. 2021, pp. 39-46.
2. Guang-Hui Liu, Jing-Chao Fan, Zhuang-Li Kang, Igor Mazurenko Combined effects of high-pressure processing and pre-emulsified sesame oil incorporation on physical, chemical, and

functional properties of reduced-fat pork batters Current Research in Food ScienceVolume 5, 2022, Pages 1084-1090

3. Zhao, Y.; Wang, Y.; Li, K.; Mazurenko, I. Effect of Oudemansiella raphanipies Powder on Physicochemical and Textural Properties, Water Distribution and Protein Conformation of Lower-Fat Pork Meat Batter. Foods 2022, 11, 2623.

4. Burdo, O., Bezbakh, I., Zykov, A., Fatieieva, Y., Pour, DR., Osadchuk, P., Mazurenko, I., Zhengzheng Shao, Phylipova, L. (2021). Development of the design and determination of mode characteristics of block cryoconcentrators for pomegranate juice. Eastern-European Journal of Enterprise Technologies,2(11 (110), 6–14. https://doi.org/10.15587/1729-4061.2021.230182

5. Yunbo Li, Xiaoling Liu, Haoyu Zhou, Bo Li, Igor Mazurenko. Inhibitory Mechanism of Engeletin Against α-Glucosidase. Natural Product Communications. 2021. vol 16, number 1. p. 1-5. Citation Scopus & Science Citation Index (Web of science).

6. DSTU 8449:2015 Canned food products. Methods for determining organoleptic indicators, net mass or volume and mass fraction of components Access mode: URL http://online.budstandart.com/ua/catalog/doc-page?id_doc=71575

7. DSTU 8402:2015 Products of fruit and vegetable processing Refractometric method for determining the content of soluble solids Access mode, URL http://online.budstandart.com/ru/catalog/doc-page?id_doc=82515

8. DSTU 7824:2015 Fruits, vegetables and their processed products. Methods for determining the content of total protein Access mode, URL http://online.budstandart.com/ua/catalog/doc-page?id_doc=80815

9. DSTU 6045:2008 Fruits, vegetables and processed products, canned meat and meat-vegetable products. Method for determining pH Access mode: URL: http://online.budstandart.com/ua/catalog/doc-page?id_doc=82522

10. DSTU 4954:2008. Products of fruit and vegetable processing. Method for determining sugars – Kyiv: Derzhspozhyvstandart of Ukraine, 2009. 17 p.

11. DSTU 7803:2015 Products of fruit and vegetable processing. Methods for determining vitamin C Access mode, URL http: //online. budstandart.com/ua/catalog/doc-page?id_doc=80801

12. DSTU 4305:2004 Fruits, vegetables and processed products. Method for determining carotene content. Access mode, http:// online. budstandart. com/ua/catalog/doc-page?id_doc=74266

13. DSTU 7988:2015 Products of fruit and vegetable processing. Methods for the determination of vitamins B1 and B2 Access mode, URL http: //online.budstandart.com/ua/catalog/doc-page?id_doc=80979

14. DSTU 2117-93 Products of processed vegetables and fruits. Method for determining vitamin PP Access mode, URL http://online.budstandart.com/ua/catalog/doc-page?id_doc=84940

15. 1DSTU 4940:2008. Products of fruit and vegetable processing. Method for determining the content of vitamin A. – Kyiv: Derzhspozhyvstandart of Ukraine, 2009 – 12 p.

16. 1DSTU 4957:2008. Fruits, vegetables and processed products. Method for determining titrated acidity. Replaces GOST 25555.0-82 Introduced 01.01.09. – Kyiv.: State Standard of Ukraine, 2008. 28 p.

17. DSTU 4912:2008 Fruits, vegetables and processed products. Methods for determining impurities of plant origin Access mode, URL http: //online.budstandart.com/ua/catalog/doc-page?id_doc=82521

18. DSTU 4913:2008 Fruits, vegetables and processed products. Methods for determining mineral impurities Access mode, URL http://online.budstandart.com/ua/catalog/doc-page?id_doc=84066

19. DSTU 4939:2008 Products of fruit and vegetable processing, canned meat and meat-vegetable products. Methods for determining chloride content Access mode, URL http://online.budstandart.com/ua/catalog/doc-page.html?id_doc=83279

20. DSTU ISO 6633-2001 Fruits, vegetables and processed products. Determination of lead content. Flameless atomic absorption spectrometric method (ISO 6633:1984, IDT) Access mode, URL http://online.budstandart.com/ua/catalog/doc-page?id_doc=84783

21. DSTU 6042:2008. Food products. Methods for the detection of botulinum toxins and Clostridium botulinum. Kyiv: Derzhspozhyvstandart of Ukraine, 2008. – 32 p.

22. GN 6.6.1.1-130–2006 Permissible levels of radionuclides 137Cs and 90Sr in food and drinking water. State hygienic standards [Electronic resource] // Government portal. Unified web portal of executive authorities of Ukraine. - Access mode: http://www.moz.gov.ua.

Review on working program (syllabus)

Parameter, by which is being evaluated working program (syllabus) of the educational component by the guarantor or memberproject group	**Yes**	**No**	**Comment**
Results teaching by educational component (DRN) respond NRC			
Results teaching by educational component (DRN) respond foreseen PRN (for mandatory OK)			
Results teaching by educational component give possibility to measure and to evaluate level their achievement			

Member project groups OP_____ Olga SEREDA _____

(name) (full name) (signature)

Parameter by which the work program is evaluated(syllabus) of the educational component by the teacher of the relevant department	Yes	No	Comment
General information about educational component there are sufficient			
Results teaching by educational component (DRN) respond NRC			
Results teaching by educational component (DRN) give possibility to measure and to evaluate level their achievement			
Results teaching (DRN) relate to competencies students, and not content disciplines (contain knowledge, skills,skills, and not topics educational programs disciplines)			
Content OK formed in accordance to structural-logical schemes			
Educational activity (teaching and learning methods) gives opportunity students achieve expected results teaching (DRN)			
The educational component involves learning through research, What there are appropriate and sufficient for relevant equal higher education			
Strategy evaluation in within educational component corresponds politics University/Faculty			
The provided evaluation methods allow to assessdegree of achievement of learning outcomes in education component			
Load students there are adequate volume educational component			
The recommended learning resources are sufficient for achievement results teaching (DRN)			
Literature there are relevant			
List educational resources contains necessary for achievement DRN software products			

Reviewer (teacher departments) food technology Olena Koshel.

(name) (position, Full name) (signature)