MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRICULTURAL UNIVERSITY

Department of Food Technology

Approved by
Head of Department
"25" 06 **2020**
F.V. Pertsevoy

CURRICULUM WORK PROGRAM

Modeling and planning of a scientific experiment
(code and name of the discipline)

Specialties: 181 Food Technologies, 133 Industry Engineering

Educational program of the third (educational-scientific) level of higher education for the training of doctors of philosophy

Faculty: Food Technologies

2020-2021 academic year

Work program in the discipline Modeling and planning of a scientific experiment for graduate students in the following specialties: 181 Food Technologies, 133 Industry Engineering

Developers: Mazurenko I.K., Doctor of Technical Sciences, Professor of the Department of Food Technology;
Pertsevoy F.V., Professor, Doctor of Technical Sciences, Head of the Department of Food Technology;
Melnyk O.Y., Ph.D., Associate Professor of Food Technology.

The working program was considered at the meeting of the department "Food Technology".

Minutes of June 25, 2020 № 16

Head of the Department of "Food Technology" _____ (Pertsevoy F.V.)
(signature) (surname and initials)

Agreed:

Guarantor of the educational program _____

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 discipline

<table>
<tr><td rowspan="2">Name of indicators</td><td rowspan="2">Field of knowledge, direction of training, educational and qualification level</td><td colspan="2">Characteristics of the discipline</td></tr>
<tr><td>full-time education</td><td></td></tr>
<tr><td>Number of credits - 3</td><td>Areas of knowledge: -
18 "Production and technology",
13 "Mechanical Engineering"</td><td colspan="2">Compulsory academic discipline</td></tr>
<tr><td>Modules - 2</td><td rowspan="5">Specialties:
181 Food Technology
133 Industrial engineering</td><td colspan="2">Year of preparation:</td></tr>
<tr><td>Content modules: 2</td><td>2020-2021</td><td></td></tr>
<tr><td rowspan="3"></td><td colspan="2">Course</td></tr>
<tr><td>2</td><td></td></tr>
<tr><td colspan="2">Semester</td></tr>
<tr><td>Total hours:
- 90</td><td>3rd</td><td></td></tr>
<tr><td rowspan="9">Weekly hours for full-time study:
classroom - 3
independent work of the student - 1</td><td rowspan="9">Educational degree
Doctor of Philosophy</td><td colspan="2">Lectures</td></tr>
<tr><td>14 years</td><td></td></tr>
<tr><td colspan="2">Practical, seminar</td></tr>
<tr><td>14 years</td><td></td></tr>
<tr><td colspan="2">Laboratory</td></tr>
<tr><td></td><td></td></tr>
<tr><td colspan="2">Independent work</td></tr>
<tr><td>62 years</td><td></td></tr>
<tr><td colspan="2">Individual task
-</td></tr>
<tr><td colspan="2">Type of control:
test</td></tr>
</table>

The ratio of the number of hours of classroom classes to independent and individual work is: for full-time study in the autumn semester - 28/62.

2. The purpose and objectives of the discipline

Goal: teaching discipline - is the formation of graduate students' scientific worldview, a holistic view of the methodology of scientific research and skills of practical application of specific methods of scientific research in professional activities, study of principles and methods of management and implementation of research, research organization, ethics and morality; acquisition of practical skills of research organization, publication and implementation of research results.

Task вивчення дисципліни - ознайомити аспірантів з наукою як системою знань, формами її організації і управління, системою підготовки наукових кадрів в Україні; дати уявлення про методологію наукових досліджень як інструментарій і як науку про методи і області їх застосування в науковій діяльності; розкрити значення і сутність інформаційного забезпечення наукової діяльності; ознайомити з організаційними засадами наукових досліджень; дати уявлення про етапи організаційно-методичної підготовки наукового дослідження; ознайомити з методикою експериментальних досліджень і математичного планування експерименту; ознайомити з формами апробації і реалізації наукових досліджень; дати уявлення про ефективність наукової діяльності і методику її визначення; розкрити роль і принципи наукової організації праці у науковій діяльності.

As a result of studying the discipline, the graduate student must:

know: have advanced conceptual and methodological knowledge in food technology and at the boundaries of subject areas, as well as research skills sufficient to conduct scientific and applied research at the level of the latest world achievements in the relevant field, gain new knowledge and / or innovate; know modern research methods in the field of food technology;methodological bases of scientific research; know the theoretical provisions of preparation of the publication in international peer-reviewed publications; be able to structure a scientific publication in accordance with the requirements of international scientometric databases (eg, Web of Science, Scopus); elaboration of scientific and information sources during preparation for classes, application of active teaching methods.

be able: plan and perform experimental and / or theoretical research in food interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge about the research problem; independently conduct research and make decisions;use various forms of testing and implementation of scientific results; content and procedure for calculating the main quantitative scientometric indicators of scientific efficiency (citation index, Hirsch index (h-index), impact factor (IF), to formulate a scientific problem given the values of modern society and the state of its scientific development, working hypotheses of the problem , which should expand and deepen the state of research in the relevant specialties.

Curriculum of the discipline

The working curriculum is being tested by the Department of Food Technology. Protocol № 16 of 25 June 2020.

Module 1. Search and processing of scientific and technical information. Registration and implementation of research results

Topic 1. The choice of direction and theme, the formation of research problems. Search, accumulation and processing of scientific and technical information.

Choice of direction of scientific research. Methods of substantiation of research topics. Informatics as a science. Scientific documents and publications. State system of scientific and technical information. Information search. Scientific and technical patent information. Classification of information support of scientific research. Basic concepts, terms and areas of information. National system of scientific and technical information. Types, sources of information and modes of access to it. Scientific information in documents. Organization of work with international and abstract databases and scientometric platforms.

Topic 2. Registration of results of scientific work and transfer of information.

Analysis of the results of theoretical and experimental research and the formation of conclusions and proposals.

Topic 3. Implementation and effectiveness of research. State implementation system. Efficiency and criteria of scientific work.

Topic 4. Organization of work in the research team.

Research planning and programming. Basic principles of research team management. Business correspondence.

Module 2. Research methodology

Topic 5. Methodology of theoretical research.

Tasks and methods of theoretical research. Research models. Analytical research methods using experiments. Probabilistic-statistical research methods.

Topic 6. Methodology of experimental research.

Tasks and methods of experimental research. Metrological support of experimental research. Development of a plan-program of the experiment. Workplace of the experimenter and his organization. The influence of psychological factors on the course and quality of the experiment.

Topic 7. Processing the results of experimental research.

Methods for estimating random errors in measurements. Methods of graphical processing of measurement results. Methods of selection of empirical formulas. Regression analysis. Assessment of the adequacy of theoretical solutions.

4. The structure of the discipline

Names of content modules and topics	Number of hours											
	Full-time						Correspondence form					
	Total	including					total	including				
		l	n	lab	ind	s. r.		l	n	lab	ind	s.r.
1	2	3	4	5	6	7	8	9	10	11	12	13
Module 1. Search and processing of scientific and technical information. Registration and implementation of research results												
Topic 1. The choice of direction and theme, the formation of research problems. Search, accumulation and processing of scientific and technical information.	**14**	**2**	**4**			**8**						
Topic 2. Registration of results of scientific work and transfer of information.	**10**	**2**				**8**						
Topic 3. Implementation and effectiveness of research.	**14**	**2**	**4**			**8**						
Topic 4. Organization of work in the research team.	**12**	**2**	**2**			**8**						
Together for module 1	**48**	**8**	**10**			**32**						
Module 2. Research methodology												
Topic 5. Methodology of theoretical research.	**12**	**2**				**10**						
Topic 6. Methodology of experimental research.	**12**	**2**				**10**						
Topic 7. Processing the results of experimental research.	**16**	**2**	**4**			**10**						
Together for module 2	**42**	**6**	**4**			**30**						
Total hours	**90**	**14**	**14**			**62**						

5. Topics and plan of lectures

№ s / n	Name topics	Number hours
1	Topic 1. The choice of direction and theme, the formation of research problems. Search, accumulation and processing of scientific and technical information. Plan 1. Choice of direction of scientific research. 2. Methods of substantiation of research topics. 3. Information search. Scientific and technical patent information. 4. Organization of work with international and abstract databases and scientometric platforms.	2
2	Topic 2. Registration of results of scientific work and transfer of information. Plan **1.** Analysis of the results of theoretical and experimental research. **2.** Formation of conclusions and proposals.	2
3	Topic 3. Implementation and effectiveness of research. Plan 1. State implementation system. 2. Efficiency and criteria of scientific work.	2
4	Topic 4. Organization of work in the research team. Plan 1. Research planning and programming. 2. Basic principles of research team management. 3. Business correspondence.	2
5	Topic 5. Methodology of theoretical research. Plan 1. Tasks and methods of theoretical research. 2. Research models. 3. Analytical research methods using experiments. 4. Probabilistic-statistical research methods.	2
6	Topic 6. Methodology of experimental research. Plan 1. Tasks and methods of experimental research. 2. Metrological support of experimental research. 3. Development of a plan-program of the experiment. 4. Workplace of the experimenter and his organization. The influence of psychological factors on the course and quality of the experiment.	2
7	Topic 7. Processing the results of experimental research. Plan	2

	1. Methods for estimating random errors in measurements. 2. Methods of graphical processing of measurement results. 3. Methods of selection of empirical formulas. 4. Regression analysis. 5. Assessment of the adequacy of theoretical solutions.	
	Together	14

Practical training

№ s / n	Name topics	Number hours
1	Metrological examination of technical documentation during research work.	4
2	Construction of theoretical research models. Research methods: мetodology and logic of scientific research; analysis, synthesis, induction, deduction, analogy; modeling, abstraction and concretization; system analysis and prediction.	4
3	Development of a plan-program of the experiment (block diagram) and determination of the main factors.	2
4	Processing of experimental data depending on types of measurements.	4
	Total	**14**

6. Independent work

№ s / n	Name topics	Number hours
1	Topic 1. The choice of direction and theme, the formation of research problems. Search, accumulation and processing of scientific and technical information.	8
2	Topic 2. Registration of results of scientific work and transfer of information.	8
3	Topic 3. Implementation and effectiveness of research.	8
4	Topic 4. Organization of work in the research team.	8
5	Topic 5. Methodology of theoretical research.	10
6	Topic 6. Methodology of experimental research.	10
7	Topic 7. Processing the results of experimental research.	10
	Total	**62**

6. Teaching methods

1. Methods of teaching by source of knowledge:

1.1. ***Verbal***: story, explanation, conversation), visual (demonstration, multi-criteria evaluation of current work applicants for higher education: level of knowledge, observation.

1.3. ***Practical***: laboratory method, production and practical methods.

2. Teaching methods by the nature of the logic of cognition.

2.1.***Analytical; synthesis methods; inductive; deductive method.***

3. Teaching methods by the nature and level of independent mental activity of students.

3.1. ***Problematic***

3.2 ***Research***

3.3 Reproductive

3.4 ***Explanatory and demonstrative***

*3.5 Partially**search engine***

4. Learning through research: (participation in research projects); personalized learning (Personalized Learning).

5. Active teaching methods - use of technical teaching aids, business and role-playing games, use of problem situations, excursions, on-the-job training, group research, self-assessment of knowledge, simulation teaching methods (based on simulation of future professional activity), use of training and control tests, use of reference lecture notes)

6. Interactive learning technologies - use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, cooperation of students (cooperation)).

7. The program uses the following advanced approaches:student-centered and problem-oriented learning, self-study, self-development and self-management. Individual and creative approach; mastering the methodology of scientific research and experimental technology, adequate to solve scientific problems.

8. Methods of control

1. Rating control according to the 100-point scale of ECTS assessment

2. Carrying out intermediate control during the semester (intermediate certification)

3. Polycriteria assessment of current work of students:

- the level of knowledge demonstrated in practical, laboratory and seminar classes;
- activity during the discussion of issues raised in class;
- independent study of the topic as a whole or individual issues;
- writing essays;

- test results;
- written tasks during tests.

4. Direct consideration in the final assessment of the student's performance of a particular individual task:
- educational and practical research with presentation of results, etc.

9. Distribution of points received by students

for offset

Current testing and independent work			WITH PWITH	Together for modules and VTS	Ate-sta-tion	Sum
Module 1	Module 2	Module 3	15	85 (70 + 15)	15	100
Meaningful module 1	Meaningful module 2	Meaningful module 3				
T1	T2	T3				
23	23	24				

10. Assessment scale: national and ECTS

The sum of points for all types of educational activities	**ECTS assessment**	**Score on a national scale**	
		for exam, course project (work), practice	**for offset**
90 - 100	**AND**	perfectly	credited
82-89	**IN**	fine	
75-81	**WITH**		
69-74	**D**	satisfactorily	
60-68	**IS**		
35-59	**FX**	unsatisfactory with the possibility of reassembly	not credited with the possibility of re-assembly
1-34	**F**	unsatisfactory with mandatory re-study of the discipline	not enrolled with mandatory re-study of the discipline

11. Recommended literature

Basic

1. Grushko IM Fundamentals of scientific research / IM Grushko, VM Sidenko. - Kharkiv: Higher School, 1983. - 224 p.

2. Gavrilov EV Technology of scientific research and technical creativity / EV Gavrilov, MF Dmitrichenko, VK Dolya and others. - Kyiv: Knowledge of Ukraine, 2007. - 318 p.

3. Mokin BI Mathematical methods of identification of dynamic systems: a textbook / BI Mokin, VB Mokin, OB Mokin. - Vinnytsia: VNTU, 2010. - 260 p.

4. Krinetsky II Fundamentals of scientific research / II Krinetsky. - Киев - Одесса: Вища школа, 1981. - 208 с.

5. Maltsev PM Fundamentals of scientific research / PM Maltsev, NA Emelyanova. - Kiev: Higher School, 1982. - 192 p.

6. Palchevsky BA Scientific research: object, direction, method / BA Palchevsky. - Lviv: Higher School, 1979. - 180 p.

7. Chkalova ON Fundamentals of scientific research / ON Chkalova. - Kiev: Higher School, 1978. - 120 p.

8. Shulga ZP On the methodology of research work / ZP Shulga. - Kiev: Higher School, 1978. - 158 p.

9. Lazarev Yu. Modeling of processes and systems in MATLAB. Training course / Yu. Lazarev. - СПб. : Peter; Kiev: BHV Publishing Group, 2005. - 51 p.

10. Makarov EG MathCAD: Training course / EG Makarov. - СПб. : Питер, 2009. - 384 с.

11. Afanasyeva N. Yu. Computational and experimental methods of scientific experiment / N. Yu. Afanasyeva, 2010. - M .: KnoRus, 2010. - 330 p.

12. Zade L. The concept of linguistic variable and its application to the adoption of approximate solutions / L. Zade: trans. with English - M .: Мир, 1976. - 167 с.

Auxiliary

13. Bruyatsky EV Mathematical methods in problems of science management / EV Bruyatsky, LP Smirnov. - Kiev: Scientific Opinion, 1973. - 184 p.

14. Shtovba SD Design of fuzzy systems by means of MATLAB / SD Shtovba. - Moscow: Hotline-Telecom, 2007. - 288 p.

15. Mityushkin YI Soft Computing: identification of patterns of fuzzy knowledge bases / YI Mityushkin, BI Mokin, AP Rothstein. - Vinnytsia: Universum-Vinnytsia, 2002. - 145 p.

16. Adler Yu. P. Introduction to the planning of the experiment / Yu. P. Adler.– Moscow: Metallurgy, 1968. - 155 p.

17. Altshuller GS Algorithm of the invention / GS Altshuller. - Москва: Московский рабочий, 1973. - 296 с.

18. Altshuller GS Find an idea: an introduction to the theory of solving inventive problems / GS Altshuller. - Novosibirsk: Nauka, 1986. - 209 p.

19. Barabashchuk VI Planning an experiment in technology / VI Barabashchuk, BP Kredentser, VI Miroshnichenko. - Киев: Техніка, 1984. - 198 с.

20. DSTU 3008-95. Documentation. Reports in the field of science and technology. Structure and design rules. - Kyiv: State Standard of Ukraine, 1995. - 37 p.

21. Sobolev PA How to learn to invent / PA Sobolev. - Uzhhorod: Karpaty, 1973. - 127 p.

22. Large explanatory dictionary of the modern Ukrainian language./ Encl. and heads. ed. W. T. Busel. - K.: Ірпінь: ВТФ «Перун», 2007. - 1736 c.

23. Philosophical encyclopedic dictionary. / Head ed. board VI Shinkaruk. - K .: Абрис, 2002. - 742 c.

Information resources

1. Library.
2. Reading room of the library.
3. Topics on the Internet:
http://www.allvet.ru/referats/35.php