



**MINISTRY OF HEALTH OF UKRAINE
NATIONAL UNIVERSITY OF PHARMACY
Faculty pharmaceutical
Department pharmaceutical technology of drugs**

MODELING OF SCIENTIFIC RESEARCH

(name of educational component)

**WORK PROGRAM
of educational component**

training second master's level
(name of higher education level)

in specialty 226 Pharmacy, industrial pharmacy
(code and specialty name)

field of knowledge 22 Public Health
(code and name of field of knowledge)

of educational program Pharmacy (for foreign students)
(name of educational program)

Kharkiv 2023
year of creation

The work program of the educational component “Modeling of scientific research”, specialty 226 Pharmacy, industrial pharmacy of the educational program Pharmacy (4.10d) engl for applicants for higher education 2nd year of study.

EDUCATIONAL COURSE TEAM:

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The work program was reviewed and approved at the meeting of the pharmaceutical technology of drugs

Record No. 1 from “_1_” of September 2023

Head of the department

_____prof. Liliia VYSHNEVSKA

The work program was approved at a meeting of the specialized methodological commission for technological disciplines

Record No. 1 from 1 September 2023

Head of the specialized commission

_____prof. Olena RUBAN

1. Description of the educational component

Language studies: English

Status educational component: selective / obligatory

Prerequisites for studying the educational component: based on the study of introduction to pharmacy, philosophy, logic, statistics, sociology, the basics of scientific research, ethics and deontology, information technology in science, computer technology in pharmacy; the discipline is the basis for the study of medical and pharmaceutical merchandising, proper practices in pharmacy, pharmaceutical chemistry, pharmaceutical management and marketing, biopharmacy, standardization of medicinal products, technology of medicinal cosmetics, which involves the integration of studying with the above-mentioned educational components for the formation of skills to apply knowledge in the process of further education and in professional activity. The study of this educational component contributes not only to increasing the professional level of conducting scientific research activities, but also to increasing the culture of thinking, the culture of mental activity in general, which helps a person to better understand and evaluate reality.

The subject of study of the educational component "Modeling of Scientific Research" is mastering methodological approaches to conducting scientific research, analysis of theoretical and empirical research methods, rational organization of the scientific research process, rules for searching scientific literature, classification and rules for working with sources of scientific information, main stages, planning and writing the final qualification paper.

Information content of the educational component. 90 is allocated to the study of the educational component **hours 3.0 credits ECTS**.

2. Objectives and tasks of the educational component

The purpose of teaching the educational component "Modeling of Scientific Research" is to acquire knowledge and skills in applying the laws of scientific knowledge, principles and methods of scientific research, basic principles of conducting scientific research in the pharmaceutical industry, as well as the form of presenting the results of scientific research.

The main **objectives** educational component "Modeling of Scientific Research" are the mastery of the basic concepts, content and functions of science and methodology, the classification of sciences and the system of training scientific personnel in Ukraine, the classification of scientific research methods, the definition and mastery of the main stages of the scientific organization of the research process, the mastery of the systematization of primary sources of scientific information and their use; concepts, functions and main types of scientific publications; structures of theses and scientific articles; methodical methods of presentation of scientific material, mastering the sequence of completion of the final qualification work, rules for working on its text and preparing for the defense.

3. Competencies and planned learning outcomes

The educational component "Modeling of Scientific Research" ensures the acquisition of applicants for higher education the following **competences**:

- **Integral competences:** the ability to solve complex problems of pharmaceutical education and science, professional and research-innovative activities in the field of pharmacy based on rethinking existing and creating new integral theoretical and practical knowledge and professional pharmaceutical practice.

- **General competences:**

GC 1. The ability to act socially responsibly and civically.

GC 2. Ability to apply knowledge in practical situations, make informed decisions.

GC 4. Ability to think abstractly, analyze and synthesize, learn and be modernly trained.

GC 5. The ability to show initiative and entrepreneurship.

GC 9. Skills in using information and communication technologies.

GC 12. Ability to conduct research at the appropriate level.

- Professional competences:

PC 5. The ability to monitor the effectiveness and safety of the use of medicinal products by the population according to the data on their clinical and pharmaceutical characteristics, as well as taking into account subjective signs and objective clinical, laboratory and instrumental criteria of the patient's examination.

PC 13. The ability to demonstrate and apply in practical activities communicative communication skills, fundamental principles of pharmaceutical ethics and deontology, based on moral obligations and values, ethical standards of professional behavior and responsibility in accordance with the Code of Ethics of pharmaceutical workers of Ukraine and WHO guidelines.

PC 15. The ability to organize and participate in the production of medicines in the conditions of pharmaceutical enterprises, including the selection and justification of the technological process, equipment in accordance with the requirements of Good Manufacturing Practice (GMP) with the appropriate development and preparation of the necessary documentation. Determine the stability of medicines

Integrative final *program learning outcomes* (PLO), the formation of which is facilitated by the educational component:

PLO1. To carry out professional activities in social interaction based on humanistic and ethical principles; to identify future professional activity as socially significant for human health.

PLO4. Demonstrate the ability to independently search, analyze and synthesize information from various sources and use these results to solve typical and complex specialized tasks of professional activity.

PLO6. Argue information for decision-making, bear responsibility for them in standard and non-standard professional situations; adhere to the principles of deontology and ethics in professional activity.

PLO7. Perform professional activities using creative methods and approaches.

PLO12. Analyze information obtained as a result of scientific research, generalize, systematize and use it in professional activities.

As a result of studying the educational component, the student must *know*:

- basic concepts, content and functions of science, classification of sciences and the system of training scientific personnel in Ukraine;
- concept, content and functions of the methodology; classification of scientific research methods;
- the main stages of the scientific organization of the research process;
- concepts, functions and main types of scientific publications; structure of thesis and scientific article;
- methodical methods of presentation of scientific material;
- the sequence of completion of the graduation qualification work, the rules of working on its text and preparation for the defense

be able to:

- navigate the main sections of science and know their characteristics;
- be able to plan a working day and organize a scientist's workplace;
- to navigate in the main methods of scientific knowledge;
- find scientific information;
- analyze and use scientific information;
- compile a bibliography of literary sources;
- determine the type of scientific publication;

- conduct a structural and methodological analysis of a scientific article;
- use methodical methods of presentation of scientific material;
- orient yourself in the sequence of completion of the graduation qualification work;
- formulate general requirements for the structure of scientific work;
- prepare and present the final qualification work

possess:

- methodical methods of presentation of scientific material;
- rules of preparation for publication of scientific publications;
- methods of searching for scientific information;
- knowledge of the structure and requirements of the graduation qualification work.

4. The educational component structure

Names of content modules and topics	The amount of hours					
	Pharmacy (4.10d) engl s/o					
	the whole amount	including				
l.		p.	lab.	sem.	self-study	
1	2	3	4	5	6	7
Content module 1 . Modeling of scientific research						
Topic 1. Science as a sphere of human activity	10	1	2			7
Topic 2. Methods of scientific research	10	1	2			7
Topic 3. Organization and conduct of scientific research	10	1	2			7
Topic 4. Documentary information and its types	10	1	2			7
Topic 5. Search and analysis of scientific information	10	1	2			7
Topic 6. Scientific publication: concepts, functions, main types	10	1	4			5
Topic 7. Organization of the graduation qualification (master's) work	10	2	4			4
Topic 8. Scientific research at the National Pharmaceutical University	10	1	-			7
SM1 control	9		2			6
Semester credit from module 1	1		1			-
The whole amount of hours for the content module 1	90	9	21			60
<i>The whole amount of hours for the course</i>	90	9	21			60

5. Contents of the educational component

Content module 1. Modeling of scientific of research

Topic 1. Science as a sphere of human activity

The history of the development of science. The main periods of its development. Science: purpose, functions, tasks. Basic concepts of science: scientific idea, hypothesis, theory, law, scientific concept, principle, concept, scientific fact, judgment, inference, postulate, category. Classification of sciences. Academic degrees that exist in Ukraine. Academic titles that exist in Ukraine.

Topic 2. Methods of scientific research.

Definition and classification of methods of scientific knowledge. Philosophical (general) methods – dialectic, metaphysics, eclecticism, sophistry, formal-logical method, formal logic. Methods of empirical research - observation, description, comparison, measurement, experiment. Methods of theoretical knowledge. Research methods at the empirical and theoretical levels (general). Modeling method (definition, purpose of the method, types). Partial (special) research methods.

Topic 3. Organization and conduct of scientific research

Procedure for organization of research work. The organizational stage of the research process. Experimental stage of the research process. The stage of generalization, approval and implementation of research results.

Topic 4. Documentary information and its types.

The role of information in scientific research, its essence. Documentary information and its types. Classification of scientific documents. Types of secondary information and its characteristics. Published and unpublished documents.

Topic 5. Search and analysis of scientific information

Library and information activity. Electronic search of scientific information on the Internet. Scientometric databases. Search systems of scientific information. Analysis of scientific information.

Topic 6. Scientific publication: concepts, functions, main types.

Concept and functions of scientific publication. The concept of a scientific article, its structure. Methodical methods of presentation of scientific material. Scientific report: concepts, types.

Topic 7. Organization of the completion of the final qualification (master's) thesis

The sequence of the master's thesis. Preparatory stage of work. Work on the text of the final qualification (master's) thesis. Preparation for the defense and defense of the final qualification (master's) thesis.

Topic 8. Scientific research at the National Pharmaceutical University

Research activities of the National Pharmaceutical University. Research directions of chemical departments (pharmacognosy, pharmaceutical chemistry, chemistry of natural compounds and nutraceuticals, medical chemistry). Research directions of economic and management departments (pharmaceutical marketing and management, organization and economy of pharmacy, social pharmacy). Research directions of medical and biological departments (clinical pharmacology and clinical pharmacy). Research directions of technological departments (plant technology of drugs, pharmacy technology of drugs, technology of pharmaceutical preparations, technology of drugs).

The content module is conducted in order to check the level of assimilation of the theoretical material. Theoretical knowledge is monitored by means of a written survey based on cards. Semester control of the module - semester credit.

6. Topics of lectures

No s/p	Name of topic	Volume in hours
		Pharmacy (4.10d) engl
1	Science as a sphere of human activity	1
2	Methods of scientific research	1
3	Organization and conduct of scientific research	1
4	Documentary information and its types	1
5	Search and analysis of scientific information	1
6	Scientific publication: concepts, functions, main types	1
7	Organization of the completion of the final qualification (master's) work	2
8	Scientific research at the National Pharmaceutical University	1
The whole amount of hours		9

7. Topics of seminars

Not provided for in the curriculum

8. Topics of practical lessons

No s/p	Name of topic	Volume in hours
		Pharmacy (4.10d) engl
1	Science as a sphere of human activity	2
2	Methods of scientific research	2
3	Organization and conduct of scientific research	2
4	Documentary information and its types	2
5	Search and analysis of scientific information	2
6	Scientific publication: concepts, functions, main types	4
7	Organization of the completion of the final qualification (master's) work	4
8	Content module control	2
9	Semester credit from module 1	1
The whole amount of hours		21

9. Topics of laboratorial lessons

Not provided for in the curriculum

10. Self-study work

No s/p	Name of topic	Volume in hours
		Pharmacy (4.10d) engl
1	Science as a sphere of human activity	7
2	Methods of scientific research	7
3	Organization and conduct of scientific research	7
4	Documentary information and its types	7

5	Search and analysis of scientific information	6
6	Scientific publication: concepts, functions, main types	7
7	Organization of the completion of the final qualification (master's) work	4
8	Scientific research at the National Pharmaceutical University	9
9	Content module	6
The whole amount of hours		60

Tasks for independent work

1. Scientific revolutions in the world. Their causes and results.
2. Forms of organization and management of science in Ukraine.
3. Basic concepts of methodology.
4. Classification of scientific research methods.
5. The structure of the research work plan.
6. Technical and economic justification of research work.
7. Scientific information activity.
8. Subsystem of information about the subject of research.
9. Deposit of documents.
10. Source data of the publication.
11. Information publications, their purpose.
12. Academic and "predatory" publications.
13. Methods of analysis of literary sources.
14. Types of scientific journals in the pharmaceutical industry.
15. Normative documentation regulating the compilation of a bibliographic list of literary sources.
16. The structure of the task for the completion of the final qualification (master's) work.
17. Scientific schools of the National Pharmaceutical University.

11. Criteria and evaluation order of educational outcomes

The criteria for evaluating the knowledge and skills of higher education students from the educational component were developed in accordance with the "Regulations on the procedure for evaluating the results of higher education students at the National Pharmaceutical University". The evaluation of the success of a higher education student in the educational component is a rating, presented on a one-point scale and defined according to the ECTS system and the traditional scale adopted in Ukraine.

Assessment of current educational activity (carried out during each lesson) - test control, control of theoretical knowledge, practical skills and abilities. When mastering each topic for the current educational activity, higher education applicants are awarded points for all types of activities, which form the current rating at the end of studying the content module.

Evaluations (in points) are reflected in the calendar-thematic plans of practical classes.

Evaluation criteria	Points
<ul style="list-style-type: none"> ➤ showed comprehensive and in-depth knowledge of the theoretical material on the subject of the lesson, which is presented in the lecture texts and additional literature; ➤ completed homework flawlessly; ➤ gave comprehensive answers to the teacher's theoretical questions 	9-10
<ul style="list-style-type: none"> ➤ showed full knowledge of the theoretical material on the topic of the class, which is presented in the texts of the lectures; 	7-8

<ul style="list-style-type: none"> ➤ completed homework without errors; ➤ gave answers to the teacher's theoretical questions with minor shortcomings 	
<ul style="list-style-type: none"> ➤ showed satisfactory knowledge of the theoretical material on the topic of the lesson; ➤ completed homework with errors; ➤ gave answers to theoretical questions with errors, which he corrected with the help of the teacher; 	6
<ul style="list-style-type: none"> ➤ did not complete homework; ➤ did not get acquainted with the theoretical material on the topic of the lesson, which is presented in the texts of the lectures; ➤ did not answer the teacher's theoretical questions 	0-5

Individual work student of higher education is monitored during each seminar class, during the control of the content module.

At the department of drug technology, if absent from class for any reason (honorable or non-honorable), students of higher education must complete the class in full, with the permission of the dean's office or their teacher on duty, according to the department's schedule, in a free laboratory.

Criteria for evaluating the performance of higher education applicants on content control

Applicants of higher education who have completed all types of work provided for in the curriculum and completed all missed classes are admitted to the content module. The content module is evaluated in points: the minimum number is 24, the maximum number is 40 points.

Evaluation criteria	Points
theoretical training: <ul style="list-style-type: none"> ➤ gave a comprehensive answer to the theoretical question; practical training: <ul style="list-style-type: none"> ➤ excellently performed a practically oriented task 	36-40
theoretical training: <ul style="list-style-type: none"> ➤ gave an answer to a theoretical question with minor flaws; practical training: <ul style="list-style-type: none"> ➤ completed a practically-oriented task with minor shortcomings 	31-35
theoretical training: <ul style="list-style-type: none"> ➤ answered the theoretical question with errors; practical training: <ul style="list-style-type: none"> ➤ performed a practical-oriented task with errors 	24-30
theoretical training: <ul style="list-style-type: none"> ➤ did not answer the theoretical question; practical training: <ul style="list-style-type: none"> ➤ did not complete a practical task 	0-23

**Scheme of accrual and distribution of points
Pharmacy (4.10d) engl**

Current assessment and independent work							Sum
Content module 1							
T1	T2	T3	T4	T5	T6	T7	CMC
6-10	6-10	6-10	6-10	6-10	6-10	6-10	24-40
36-60							60-100

T1, T2 ... T7 - topics of the module.

Scheme of accrual and distribution of points

12. Forms of progress and semester supervision of academic achievements

Content module control is conducted in the form of a semester credit.

13. Methodological support

1. Working curriculum.
2. Calendar plan of lectures and seminar classes.
3. Studying aids.
4. Multimedia texts of lectures.
5. Methodical recommendations for classroom work of students of higher education.
6. Methodical recommendations for independent and extracurricular work of students of higher education.
7. Methodological recommendations for preparing for the final modular control.
8. Methodological support for knowledge control of higher education students (control tasks and tests), their evaluation criteria, standards of answers:
 - Tickets for the content module
9. Tests to determine the level of knowledge.
10. A set of situational problems for classes.
11. Educational equipment, technical means of education

14. Reading suggestions

The main reading suggestions

1. Yarnykh T. G., Pul-Luzan V. V., Rukhmakova O. A., Buryak M. V., Orlovetskaya N. F., Dankevich O. S., Kotenko O. M., Yurieva G. B., Herasymova I. V., Kovalov V. V., Levachkova Yu. V., Zhivora N. V., Oliinyk S. V., Sahaidak-Nikitiuk R. V. Modeling of scientific research [URL] : A tutorial for extracurricular activities for applicants for higher pharmaceutical education / ed. prof. T. G. Yarnykh. – Kharkiv : NUPh, 2022. – 140 p.
2. Yarnykh T. G., Rukhmakova O. A., Kotenko O. M., Sahaidak-Nikitiuk R. V., Levachkova Y. V., Kovalov V. V., Buryak M. V., Zhivora N. V., Pul-Luzan V. V., Oliinyk S. V. Modeling of scientific research : Guidelines for conducting practical classes ; 2 Ed. / under the editorship of prof. T. G. Yarnykh. – Kharkiv : NUPh, 2023. – 50 p.

Supplementary reading suggestions

1. Textbook of lectures on “Methodology and logic of scientific reaserch”: A tutorial for extracurricular activities for applicants for higher pharmaceutical education / T. G. Yarnykh, O. A. Rukhmakova, M. V. Buryak, Yuryeva G. B., Herasymova I. V., Pul-Luzan V. V., Oliinyk S. V., Orlovetskaya N. F., Kotenko O. M., Dankevych O. S., Kovalev V. V., Levachkova Yu. V., Zhivora N. V., Chushenko V. M. / ed. prof. T. G. Yarnykh. – Kharkiv .: NUPh, 2021. – 115 p.
2. Methodology and logic of scientific reaserch: Guidelines for practical classes for English-speaking applicants of higher pharmaceutical education / T. G. Yarnykh, O. A. Rukhmakova, M. V. Buryak, Yuryeva G. B., Herasymova I. V., Pul-Luzan V. V., Oliinyk S. V., Orlovetskaya N. F., Kotenko O. M., Dankevych O. S., Kovalev V. V., Levachkova Yu. V., Zhivora N. V., Chushenko V. M. / ed. prof. T. G. Yarnykh. – Kh .: NUPh, 2021. – 42 c.
3. Methodological recommendations for preparation for the final modular control in the discipline “Methodology and logic of scientific research”/ T. G. Yarnykh, O. A. Rukhmakova, M. V. Buryak, Yuryeva G. B., Herasymova I. V., Pul-Luzan V. V., Oliinyk S. V., Orlovetskaya N. F., Kotenko O. M., Dankevych O. S., Kovalev V. V., Levachkova Yu. V., Zhivora N. V., Chushenko V. M. / ed. prof. T. G. Yarnykh. – Kh .: NUPh, 2021. – 15 p.

4. Vovk N. Algorithm of user request in archival information and search systems / N. Vovk // Information, communication, society 2018: Materials of the 7th International Scientific Conference ICS -2018. – Lviv: Publishing House of Lviv Polytechnic, 2018. – P. 127-128.
5. Law of Ukraine "On Scientific and Scientific-Technical Activity" // Bulletin of the Verkhovna Rada of Ukraine. – 2007. – No. 2-3, Art. 20.
6. Zatserkovny V. I. Methodology of scientific research: teacher. manual / V. I. Zatserkovny , I. V. Tishaev , V. K. Demidov. – Nizhyn: NSU named after M. Gogol, 2017. – 236 p.
7. Methodology and organization of scientific research: research in social and economic sciences. Education manual 2nd ed., rev. and add. K.: NTUU "KPI named after Igor Sikorsky", 2022. 173 p.
8. Methods and organization of scientific research: Teaching. manual / S. E. Vazhynskyi, T. I. Shcherbak. – Sumy: A. S. Sumy SPU. Makarenko, 2016. – 260 p.
9. Methodology and organization of scientific research: teaching method. edition. / O.V. Galyan. Lutsk: Tower-Print, 2021. 26 p.
10. Methodology scientific studies : textbook / O. G. Danilyan , O. P. Dzoban . - Kharkiv : Pravo, 2019. - 368 p.
11. Danilyan O. G. Organization and methodology of scientific research: teaching. manual / O. G. Danilyan , O. P. Dzoban . - Kharkiv: Pravo, 2017. - 448 p.
12. Methodology and organization of scientific research: teaching manual / I. S. Dobronravova, O. V. Rudenko, L. I. Sydorenko and others. – Kyiv: "Kyiv University", 2018. – 607 p.
Andriychuk V. G. The essential aspect of the methodology of scientific research / V. G. Andriychuk // Economics of AIC. – 2016. – no. 7. – P. 87-94.

15. Electronic resources, including the Internet

1. Ministry of Health of Ukraine [Electronic resource]: official website. - Access mode: www.moz.gov.ua - (access date 26.08.2023).
2. National Pharmaceutical University [Electronic resource]: Scientific library of the National Pharmaceutical University. – Access mode: <http://lib.nuph.edu.ua> (access date 26.08.2023).
3. National Pharmaceutical University. Department of Medicine Technology [Electronic resource]: website of the Department of Medicine Technology. – Access mode: <http://tl.nuph.edu.ua> (access date 26.08.2023).
4. Electronic archive of the library of the National Academy of Sciences of Ukraine. <http://lib.nuph.edu.ua>; e- mail library@nuph.edu.ua
5. Educational portal <http://pharmel.kharkiv.edu> - the center of distance technologies of the National Academy of Sciences