MINISTRY OF HEALTH OF UKRAINE
BUKOVINIAN STATE MEDICAL UNIVERSITY

APPROVE
Vice-Rector of higher educational establishment on
Scientific and Pedagogical Work and International Relations
_____Oksana GODOVANETS
«_29_» _____08_____ 2025

SYLLABUS
of studying the discipline

«Evidence-Based Medicine»

Field of knowledge	22 Healthcare
Specialty	221 Dentistry
Educational degree	PhD
Educational year	I
Form of study	full-time, part-time, distance
Department	Medical and Biological Physics and Medical Informatics

Approved at a meeting of the department of medical and biological physics and medical informatics «_27_» _____08_____ 2025 (Protocol №_2_).

Head of the Department _____ Volodymyr FEDIV

Approved by the subject methodical commission in medical and biological subjects of physiological and physicochemical profile «_29_» _____08_____ 2025__ (Protocol №_1_).

Chairman of the subject methodical commission _____ Svitlana TKACHUK

Chernivtsi – 2025

1. GENERAL INFORMATION ABOUT SCIENTIFIC AND PEDAGOGICAL WORKERS WHO TEACH THE DISCIPLINE

Department	Medical and Biological Physics and Medical Informatics
Surname, first name, patronymic of scientific and pedagogical staff, position, academic degree, academic title, e-mail	Ivanchuk Maria Anatoliivna – Associate Professor of the Higher Education Institution, Candidate of Physical and Mathematical Sciences, Associate Professor. ivanchuk.m@bsmu.edu.ua Olar Olena Ivanivna – Associate Professor of the Higher Education Institution, Candidate of Physical and Mathematical Sciences, Associate Professor olena.olar@bsmu.edu.ua
Department's webpage on the official website of the university	https://www.bsmu.edu.ua/biologichnoyi-fiziki-ta-medichnoyi-informatiki/
Website of the department	https://bphmi.bsmu.edu.ua/
E-mail	biophysics@bsmu.edu.ua
Address	O. Kobylianska St., 42
Contact phone number	+380372524544

2. GENERAL INFORMATION ABOUT THE DISCIPLINE

Discipline status	Selective
Number of credits	3
Total Hours	90
Lectures	0
Practical classes	30
Independent work	60
Type of final control	Credit

3. DESCRIPTION OF THE DISCIPLINE (ABSTRACT)

The discipline of Evidence-Based Medicine is selective and refers to the professional training of a candidate for the degree of Doctor of Philosophy in the specialty 221 "Dentistry". Weight is given to the in-depth study of the use of modern information technologies for statistical processing of information using special software packages, namely finding sample characteristics and graphical representation of statistical populations, checking the distribution of the sample population for normality, comparing dependent populations, comparing independent populations, conducting correlation and regression analysis, conducting variance analysis, analysis of relative values.

4. POLICY OF THE DISCIPLINE

4.1. ***List of regulatory documents:***

- Regulations on the organization of the educational process – https://cutt.ly/ArUqCMFh;
- Instruction on Assessment of Educational Activities of BSMU Applicants in the Context of the Implementation of the European Credit Transfer System for the Organization of the Educational Process – https://cutt.ly/yrUqVPvn;
- Regulations on the procedure for working out missed and uncredited classes – https://cutt.ly/jrUqBS36;
- Regulations on Appeal of the Results of the Final Control of Knowledge of Higher Education Applicants – https://cutt.ly/3rUqMAbV;
- Code of Academic Integrity – https://cutt.ly/FrUq1ljK;
- Regulations on the prevention of academic plagiarism – https://cutt.ly/MrUq6QAt;

- Regulations on the procedure and conditions for choosing elective disciplines by PhD students – https://cutt.ly/srUwo6Ci;
- Regulations on the Procedure for Recognizing Learning Outcomes Obtained through Non-Formal and/or Informal Education – https://cutt.ly/SrUwp1ie;
- Rules of conduct for PhD students – https://cutt.ly/ErUq72rZ;
- The rules of internal labor regulations are https://cutt.ly/UrUwiACe.

4.2. ***Policy on compliance with the principles of academic integrity of PhD students:***
- independent performance of educational tasks of current and final controls without the use of external sources of information;
- cheating during knowledge control is prohibited;
- independent performance of individual tasks and correct registration of references to sources of information in case of borrowing ideas, statements, information.

4.3. ***Policy on compliance with the principles and norms of ethics and deontology by PhD students:***
- actions in professional and educational situations from the standpoint of academic integrity and professional ethics and deontology;
- compliance with the rules of the internal regulations of the university and the rules of conduct of PhD students, to be tolerant, friendly and balanced in communication with PhD students and employees of departments, health care institutions, etc.;
- awareness of the significance of examples of human behavior in accordance with the norms of academic integrity and medical ethics.

4.4. ***Policy on attendance of classes by PhD students:***
- Attendance at all training sessions (lectures, practical (seminar) classes, final modular control) is mandatory for the purpose of current and final assessment of knowledge (except for cases for good reasons).

4.5. ***Deadline policy and working out missed or uncredited classes by higher education applicants:***
- Missed classes are processed according to the schedule of missed or uncredited classes and consultations.

5. PREREQUISITES AND POST-REQUISITES OF THE ACADEMIC DISCIPLINE (INTERDISCIPLINARY RELATIONS)

List of academic disciplines on which the study of the academic discipline is based	List of academic disciplines for which the foundation is laid as a result of studying the academic discipline
Biostatistics	Disciplines of the cycle of professional training
Modern information technologies	
Ethics and methodology of scientific research. Fundamentals of Academic Integrity	

6. PURPOSE AND OBJECTIVES OF THE DISCIPLINE:

6.1. The purpose of studying the discipline is to acquire and deepen a complex of knowledge, skills, abilities and other competencies sufficient to produce new ideas, solve complex problems in this discipline, master the methodology of scientific activity, as well as conduct your own scientific research that solves topical scientific problems, the results of which have scientific novelty, theoretical and practical significance.

6.2. The main tasks of studying the discipline are:
- mastering the basic principles of evidence-based medicine
- acquisition of skills in searching for scientific and professional information;
- acquisition of skills in information processing;

- acquisition of skills in working with special software packages for statistical data processing

7. COMPETENCIES, THE FORMATION OF WHICH IS FACILITATED BY THE ACADEMIC DISCIPLINE:

7.1.Integral competence:

Ability to produce new ideas, solve complex problems of dentistry and related interdisciplinary problems, apply the methodology of scientific and pedagogical activities, as well as conduct their own scientific research, the results of which are of scientific novelty, theoretical and practical significance.

7.2.General competencies:

GC01. Ability to solve complex problems based on a systematic scientific worldview and general cultural outlook in compliance with professional ethics and academic integrity.
GC 02. Ability to search, process and analyze information from various sources.
GC 03. Ability to abstract thinking, analysis and synthesis.
GC 04. Ability to work in an international context.

7.3.Special competencies:

SC01. Ability to perform original research, achieve scientific results that create new knowledge in dentistry and related areas of medicine and can be published in leading international scientific publications.
SC05. Ability to generate new ideas for the development of the theory and practice of dentistry, identify problems, pose and solve problems of a research nature in the field of healthcare, evaluate and ensure the quality of research performed in dentistry.
SC06. Ability to apply modern digital technologies, databases and other electronic resources, specialized software in scientific and educational activities.
SC08. Ability to continuous self-development and self-improvement.

8. LEARNING OUTCOMES.

The discipline provides the formation of the following learning outcomes:

LO01. Have conceptual and methodological knowledge of dentistry and at the border 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 area, gain new knowledge and/or innovate.

LO03. To freely present and discuss with specialists and non-specialists the results of research and applied problems of dentistry in state and foreign languages, to publish the results of research in scientific publications in leading international scientific journals.

LO04. Formulate and test hypotheses; use appropriate evidence to substantiate conclusions, in particular, the results of theoretical analysis, experimental research, statistical analysis of data, available literature data.

LO05. Apply modern tools and technologies for searching, processing and analyzing medical and biological information, in particular, statistical methods for analyzing data of large volume and/or complex structure, specialized databases and information systems.

LO07. Develop and implement scientific and/or innovative medical projects that provide an opportunity to rethink existing and create new holistic knowledge and/or professional practice and solve significant problems in the field of medicine.

As a result of studying the academic discipline, the PhD student must:

8.1.Know:

- Basic principles of evidence-based medicine
- Leading information resources for information retrieval
- Modern information technologies

- Research ethics
- Legal basis of copyright
- Principles for the prevention of plagiarism, falsification and corruption
- Quality standards
- Quality assessment criteria
- Forms and methods of evaluation of the results of educational and scientific activity
- Content of the discipline (by specialization) in accordance with future professional activity
- Key concepts in the field of scientific research
- Priority areas for the development of science and medicine
- World Information Resources
- The essence of the research process
- Principles of generating statistical and scientific hypotheses
- Technology of formulating a research question
- Types of systematic errors, ways to prevent them
- Modern research methods
- Basics of biostatistics
- Methods of statistical analysis
- Presentation of the results of statistical data processing
- Varieties of special software packages for statistical processing of medical experiment data
- Differences between statistical data processing software packages
- Basic principles of working with various types of software packages for statistical data processing

8.2.Be able to:

- Use modern information technologies to search and process information
- Conduct information search
- Independently carry out educational and scientific activities
- Express your views
- Make your own decisions
- Analyze the main theories and concepts in the field of study
- Interpret the results of research in the chosen scientific direction
- Conduct a critical analysis of modern scientific literature
- Adequately assess the achievements and limitations of research in the chosen scientific direction
- Formulate research questions and hypotheses
- Define research design
- Develop a research plan
- Assess the impact of intervening factors
- Predict system errors
- Choose research methods adequate to achieve the goals and objectives of a scientific project
- Interpret the results of different research methods
- Justify sample size
- Formulate statistical hypotheses
- Adequately use statistical analysis techniques
- Use special software packages for statistical processing of medical experiment data
- Choose software packages for statistical processing of your own scientific research data

8.3.Demonstrate:

- skills in collecting and statistical processing of scientific research data

- skills in formulating statistical hypotheses, their acceptance/rejection, formulating conclusions of scientific research results

9. INFORMATION VOLUME OF THE DISCIPLINE

MODULE 1. Evidence-based medicine

Content module 1. Evidence-based medicine

Specific objectives:

- master the skills of collecting and statistical processing of scientific research data
- to master the skills of formulating statistical hypotheses, their acceptance/rejection, formulating conclusions of scientific research results

Topic 1. **Basic principles of evidence-based medicine. Controlled clinical trials. Meta-analysis. Systematic reviews**

Prerequisites for the emergence of evidence-based medicine (DM). The concept of evidence-based medicine, methodology for conducting controlled clinical trials, generalization of results through systematic reviews and meta-analysis. Practical tasks of DM to optimize the activities of health care systems. Sources of information for DM.

Randomized clinical trials as a basic principle of evidence-based medicine. Methods of "stratification" and "blinding" in clinical studies. Design of parallel-group and cross-sectional research. Stages of randomized clinical trials. Classes and levels of evidence. Phases of clinical trials of medicinal products.

Cochrane cooperation, the basic principles of its work.

Topic 2. **Review of special software for statistical analysis of the results of a medical experiment**

Familiarization with the capabilities and functions of Google Tables, Statistica, Orange and online calculators for processing medical data.

Topic 3. **Finding Sample Characteristics and Graphical Representation of Statistical Populations**

Selective method. General and sample populations. Measurement scales Numerical and graphical description of the data presented in the different measurement scales.

Topic 4. **Checking the distribution of the sample population for normality**

Normal distribution law. Gaussian curve. Criteria for determining the correspondence of a data distribution to a normal distribution: Kolmogorova-Smirnova, Shapiro-Wilka, 3 sigma

Topic 5. **Comparison of dependent populations measured in interval scales and equal relationship scales**

Statistical hypotheses, their acceptance. Errors of the 1st and 2nd kind. Statistical criteria: one-sided and two-sided; for dependent and independent samples; parametric and non-parametric

PhD student's paired criterion, Rosenbaum criterion, Wilcoxon's rank criterion

Topic 6. **Comparison of independent populations measured in interval scales and equal relationship scales**

PhD student's two-sample criterion, Mann-Whitney criterion

Topic 7. **Analysis of conjugation tables.**

The concept of conjugation tables. Chi-square criterion, exact Fisher criterion, McNemar criterion. Odds ratio and relative risk.

Topic 8. **Conducting correlation and regression analysis**

Correlation analysis of Pearson, Spearman. Correlation coefficient, its properties. Strength and direction of communication. Types of correlation by form, direction, degree, strength of connection

Construction of direct regression. Multiple regression

Topic 9. **Determination of sensitivity and specificity of the method. Construction of ROC curves**

True-positive and true-negative results. False positive and false negative results. Sensitivity and specificity of the method. ROC curve, its construction, area under the curve.

Topic 10. **Conducting cluster analysis**

The concept of cluster. Cluster analysis. K-means method. Euclidean distance.

10. STRUCTURE OF THE DISCIPLINE

Names of content modules and topics	Number of hours			
	Total	including		
		Classroom		Independent Work
		Lectures	Practical classes	
1	2	3	4	5
Module 1. Evidence-based medicine				
Content module 1. Evidence-based medicine				
Basic principles of evidence-based medicine. Controlled clinical trials. Meta-analysis. Systematic reviews	6		2	4
Review of special software for statistical analysis of the results of a medical experiment	6		2	4
Finding Sample Characteristics and Graphical Representation of Statistical Populations	6		2	4
Checking the distribution of the sample population for normality	6		2	4
Comparison of dependent populations measured in interval scales and equal relationship scales	12		4	8
Comparison of independent populations measured in interval scales and equal relationship scales	18		6	12
Analysis of conjugation tables.	12		4	8
Conducting correlation and regression analysis	12		4	8
Determination of sensitivity and specificity of the method. Plotting ROC curves	6		2	4
Conducting cluster analysis	6		2	4
Total for content module 1	**90**		**30**	**60**
TOTAL HOURS	**90**		**30**	**60**

11. THEMATIC PLAN OF LECTURES

not provided

12. THEMATIC PLAN OF PRACTICAL CLASSES

№ salary	Topic name	Quantity hours
1	Basic principles of evidence-based medicine. Controlled clinical trials. Meta-analysis. Systematic reviews	2
2	Review of special software for statistical analysis of the results of a medical experiment	2

3	Finding Sample Characteristics and Graphical Representation of Statistical Populations	2
4	Checking the distribution of the sample population for normality	2
5	Comparison of dependent populations measured in interval scales and equal relationship scales	4
6	Comparison of independent populations measured in interval scales and equal relationship scales	6
7	Analysis of conjugation tables.	4
8	Conducting correlation and regression analysis	4
9	Determination of sensitivity and specificity of the method. Plotting ROC curves	2
10	Conducting cluster analysis	2
TOTAL		**30**

13. THEMATIC PLAN OF INDEPENDENT WORK

№ salary	Topic name	Quantity hours
1	Basic principles of evidence-based medicine. Controlled clinical trials. Meta-analysis. Systematic reviews	4
2	Review of special software for statistical analysis of the results of a medical experiment	4
3	Finding Sample Characteristics and Graphical Representation of Statistical Populations	4
4	Checking the distribution of the sample population for normality	4
5	Comparison of dependent populations measured in interval scales and equal relationship scales	8
6	Comparison of independent populations measured in interval scales and equal relationship scales	12
7	Analysis of conjugation tables.	8
8	Conducting correlation and regression analysis	8
9	Determination of sensitivity and specificity of the method. Plotting ROC curves	4
10	Conducting cluster analysis	4
TOTAL		**60**

14. LIST OF INDIVIDUAL TASKS

not provided

15. TASKS FOR INDEPENDENT WORK

are determined by the teacher individually for each applicant in accordance with the topic and purpose of his scientific research

16. METHODS AND FORMS OF CONTROL (including criteria for assessing learning outcomes)

During the educational program, monitoring of academic performance is carried out on the basis of data from the information on attending practical classes, performing independent work. Upon successful completion of the course, the applicant receives a mark on the success of training and the number of credits in the individual curriculum.

The results of passing tests are evaluated on a two-point scale: "enrolled", "not enrolled".

The applicant receives a grade "enrolled" if he/she has completed all types of work provided for by the working curriculum in the discipline, attended all classes determined by the thematic plan in the relevant discipline (if there are gaps - worked them out in a timely manner), scored a total number of points in the study of the academic discipline not less than 120.

The applicant receives a grade "not enrolled" if there are unworked absences from classes and the number of points for the current control is less than the minimum.

The current educational activity of the applicant is evaluated on a 4-point scale.

17. LIST OF QUESTIONS FOR THE FINAL CONTROL

not provided

18. SCHEME OF ACCRUAL AND DISTRIBUTION OF POINTS

Module number, number of teaching hours/number of ECTS credits	Number of content modules, their numbers	Number of topics evaluated	Conversion to points of traditional grades					Minimum number of points
			Traditional assessments				Points for completing an individual task	
			«5»	**«4»**	**«3»**	**«2»**		
Module 1	1 №1	10	20	16	12	0		120

The maximum number of points that a graduate PhD student can score while studying the discipline is 200 points: 20·10=20

The minimum number of points that a graduate PhD student can score while studying the discipline is 120 points: 12·10=120

Conversion of points from the discipline to the ECTS scale:

Score on a 200-point scale	**Rating on a four-point scale**
From 180 to 200 points	«5»
From 150 to 179 points	«4»
From 120 to 149 points	«3»
Less than 120 points	«2»

PhD students who study in the same course, in one specialty, based on the number of points scored in the discipline, are ranked according to the ECTS scale as follows:

ECTS assessment	**Statistical indicator**
"A"	Top 10% of graduate PhD students
"B"	Next 25% of PhD students
"C"	Next 30% of PhD students
«D»	Next 25% of PhD students

"E"	The last 10 % of graduate PhD students

Ranking with the assignment of grades "A", "B", "C", "D", "E" is carried out for PhD students who study in the same specialty and have successfully completed the study of the discipline.

Grades in the discipline "FX", "F" ("2") are given to PhD students who are not credited with at least one module in the discipline after completing its study.

The grade "FX" is given to PhD students who have scored the minimum number of points for the current educational activity, but have not received credit. This category of PhD students has the right to retake the test.

An "F" grade is given to PhD students who have attended all classroom classes in the module, but have not scored the minimum number of points for the current academic activity. This category of PhD students has the right to re-study the module.

The ECTS score to a traditional four-point scale is NOT converted because the ECTS scale and the four-point scale are independent.

19. RECOMMENDED READING

19.1 Basic (Basic)

1. Ivanchuk M.A. Statistical Analysis in Medical Research. Textbook for Applicants for the Degree of Doctor of Philosophy, Fields of Knowledge Health Care of Higher Medical Educational Institutions. Chernivtsi, Bukovyna State Medical University, 2022. 121 p.+add. https://drive.google.com/file/d/17BINqpuCVYjXADZZJN7fu0q5OQG9H9Gd/view?usp=sharing
2. Basic principles of evidence-based medicine / V. D. Syvolap, S. M. Kiselyov, D. A. Lashkul. – Zaporizhzhia: ZMU, 2020. – 208 p. https://dspace.zsmu.edu.ua/bitstream/123456789/10909/3/Доказ%20мед%20PhD_затверд.pdf
3. Methodology of evidence-based medicine: textbook (Higher Educational Institution IV r. a.) / V.F. Moskalenko, I.E. Bulakh, O.G. Puzanov. All-Ukrainian Specialized Publishing House "Medicine", 2014, 200 p.
4. How to Practice and Teach Evidence Based Medicine / S.Straus, P. Glasziou, W. Richardson, R. Haynes, R. Pattani, A. Veroniki. Elseiver, 2019. 496 p. https://dl.icdst.org/pdfs/files4/0151c55f69e2fcd3a6d1f99b6430a288.pdf

19.2. Auxiliary

1. Manual of Biostatistics. Analysis of the results of medical research in the EZR package (R-statistics): manual. Manual. / V. G. Guryanov, Y. E. Lyakh, O. V. Chaly et al. — Kyiv: Viska, 2018. 208 p. (in Russian).
2. B. Illowsky , S. Dean Statisitcs. High school, Openstax, 2020, 932 p.
3. John E. Kolassa An Introduction to Nonparametric Statistics. CRC Press, 2021, 224 p.
4. Michael A. Proschan Statistical Thinking in Clinical Trials (Chapman & Hall/CRC Biostatistics Series) 1st Edition,2021, 264 p.
5. Jay L. Devore, Kenneth N. Berk, Matthew A. Carlton Modern Mathematical Statistics with Applications, Springer, 2021, 987 p.
6. Smith G. Exercises and Solutions in Probability and Statistics, Chapman & Hall, 2025, 300 p.

19.3 Information Resources

1. Quick Statistics Calculators https://www.socscistatistics.com/tests/

2. QuickCalcs Statistical Calculators https://www.graphpad.com/quickcalcs/
3. Statistics KingdomStatistical Calculators https://www.statskingdom.com/index.html
4. Statistical calculations using Excel. Real Statistics Using Excel https://www.real-statistics.com/
5. R-based statistical analysis application. Blue Sky Statistics https://www.blueskystatistics.com/
6. Free access resource for machine learning and data visualization Orange https://orangedatamining.com/
7. Cochrane Library http://www.thecochranelibrary.com

20. SYLLABUS COMPILERS

1. Maria IVANCHUK - Associate Professor of the Institution of Higher Education, Cand. Physical and Mathematical Sciences, Associate Professor.
2. Olena OLAR - Associate Professor of the Institution of Higher Education, Cand. Physical and Mathematical Sciences, Associate Professor.