FACULTY OF MEDICINE

STUDY PROGRAM 0912.1 MEDICINE

NICOLAE TESTEMITANU CHAIR OF SOCIAL MEDICINE AND HEALTH MANAGEMENT

APPROVED
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum faculty Medicine

Minutes No. 5 of 13.01.2020

Chairman dr.hab.șt.med., prof. universitar

SUMAN SERGHEI _____

APROBATĂ
at the Council meeting of the Faculty Medicine 2

Minutes No. 3 of 25.02.2020

Dean of Faculty dr.șt.med., conf.universitar

BEȚIU MIRCEA _____

APPROVED

at the meeting of the Nicolae Testemitanu Chair of Social Medicine and Health Management

Minutes nr. 1 din 30.08.2019

Head of chair dr. hab.șt.med., conf. universitar

RAEVSCHI ELENA _____

SYLLABUS

DISCIPLINE **DESCRIPTIVE AND INFERENTIAL STATISTICS IN MEDICAL RESEARCH**

Integrated studies/ Cycle I, License

Type of course: **Optional discipline**

Chisinau, 2019

I. INTRODUCTION

- General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional / specialty training program

  The optional course "Descriptive and inferential statistics in medical research" mostly covers the practical aspects related to the realization of scientific research and the statistical data analysis. The course equips students with the necessary baggage of knowledge in order to carry out the statistical data analysis and to interpret the obtained results. The course presents a predominantly applicative approach to the statistical methods needed to solve practical problems in the biomedical field.

- Mission of the curriculum (aim) in professional training:
  Assimilation of the theoretical and practical knowledge necessary for carrying out a scientific research in the medical sciences, including the licentiate thesis.

- Language (s) of the course: Romanian, Russian, English

- Beneficiaries: students of the IV year, faculty Medicine I and II

II. MANAGEMENT OF THE DISCIPLINE

Code of discipline		**U.07.A.066.2**	
Name of the discipline		**Descriptive and inferential statistics in medical research**	
Person(s) in charge of the discipline		**Badan V., Penina., Obreja G.**	
Year	**IV**	Semester/Semesters	**VII**
Total number of hours, including:			
Lectures	**10**	Practical/laboratory hours	**10**
Seminars		Self-training	**10**
Clinical internship			
Form of assessment	**CD**	Number of credits	**1**

III. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the discipline study the student will be able to:

✓ ***at the level of knowledge and understanding:***

- To know and to apply appropriately the notions specific to the discipline, as well as the theoretical and practical contents of the discipline;
- To understand the methods of data summarizing depending on the type of data;
- To know and to understand the principles of performing the descriptive and inferential statistical data analysis;
- To know the main types of statistical tests;
- To know the principal statistical tests and the algorithm of selection of a specific test depending on the type of data and the type of research.

✓ ***at the application level:***

- To apply the methods of descriptive and inferential statistics to quantitative and qualitative data;
- To present qualitative and quantitative data graphically;
- To elaborate correctly research hypothesis;
- To apply correctly a statistical test depending on the type of data;

- To select and to apply correctly statistical tests in the hypothesis testing process;
- To apply the main methods of descriptive and inferential statistics in a statistical package EpiInfo/EXCEL.

✓ ***at the integration level:***

- To assess the place and role of biostatistics in the professional medical career;
- To integrate the knowledge in biostatistics with clinical disciplines;
- To apply the knowledge in biostatistics to practical and research activities.

IV. PROVISIONAL TERMS AND CONDITIONS

1. Language requirements;
2. Basics of the school mathematics ;
3. Basic computer skills (EXCEL);
4. Ability to work in a team.

V. THEMES AND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

Nr. d/o	THEME	Number of hours		
		Lectures	Practical hours	Self-training
1.	Biostatistics – general concepts and definitions. Types of data. Scales of measurement. Graphical presentation of data. Practical application in EpiInfo/EXCEL.	2	2	2
2.	Descriptive statistics: Measures of Central Tendency and Variability. Correlation. Practical application in EpiInfo/EXCEL.	2	2	2
3.	Direct and indirect methods of standardization. Practical application in EXCEL.	2	2	2
4.	Inferential statistics. Hypothesis testing. Parametric and non-parametric tests. Practical application in EpiInfo/EXCEL.	4	4	4
Total		**10**	**10**	**10**

VI. REFERENCE OBJECTIVES OF CONTENT UNITS

Objectives	**Content units**
Theme (<u>chapter</u>) 1. <u>Descriptive statistics</u>	
• *To define* the basic terminology used in descriptive statistics; methods of summarizing and graphical presentation of the data depending on their type; • *To know* how to analyse qualitative and quantitative data with descriptive summary statistics and graphs; the conditions under which different types of	Review of basic terminology in biostatistics: population and sample; observational unit; variable; parameters and statistics; scales of measurement. Graphical presentation of data in a statistical package EpiInfo/EXCEL. Summarizing qualitative data with numbers: measures of central tendency and variability. Calculation of measures of central tendency and variability for the ungrouped data in a statistical package EpiInfo/EXCEL. Relative location of mean, median and mode in a unimodal distribution (normal and skewed).

Objectives	Content units
correlation coefficients are used and their interpretation; • *To demonstrate* capacities to select adequately descriptive statistics and graphs for data summarizing and to interpret the obtained results; • *To apply* in a statistical package EpiInfo/EXCEL the methods of descriptive statistics for the quantitative and qualitative data. • *To integrate* the knowledge obtained in the given field for processing qualitative and quantitative data obtained in a scientific research.	Frequency distribution. Histogram and frequency polygon. Analysis of the shape of the frequency distribution and the degree of its asymmetry. Empirical rule. Five summary statistics and "boxplot". Summarizing qualitative data with numbers: ratio, proportion and rate. Direct and indirect methods of standardization of death rates. Calculation in EXCEL. Correlation: definition, size and direction. Parametric and non-parametric correlation coefficients. Conditions of application and interpretation of results. Coefficient of determination (r^2). Calculation of correlation coefficients in a statistical package EpiInfo/EXCEL.
Theme (<u>chapter</u>) 2. <u>Inferential statistics</u>	
To define the basic theoretical concepts related to the inferential statistics; *To know* the vocabulary used in the field of hypothesis testing and the main steps of application of a statistical test; *To demonstrate* the correct selection, application and interpretation of a statistical test; *To apply* the methods of inferential statistics studied within the course in a statistical package EpiInf/EXCEL; *To integrate* the obtained knowledge in the field of inferential statistics with clinical disciplines to carry out a scientific research.	Estimation of population parameters. Standard error. Confidence intervals: calculation in a statistical package EpiInfo/EXCEL and interpretation of the results. Hypothesis testing. Null and alternative hypothesis. Type I and type II errors in hypothesis testing. The significance (alpha) level and *p*-value. Confidence level and statistical power of the test. Basic steps of hypothesis testing. Parametric and non-parametric statistical tests. Selection of the statistical test depending on the number of samples and data distribution. Conditions of application and interpretation of results.

VII. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

✓ **Professional (specific) (SC) competences**

Not the case

✓ **Transversal competences (TC)**

Not the case

✓ **Study outcomes**

The student at the end of the course will be capabill:

- To prosess statistically the experimental data depending on its nature and to interprete the results of the statistical inference;
- To determine the statistical methods for data analysis taking into account the study design, the scale of measurement, the number of variables involved (independent and dependent);
- To perform an epidemiological study (descriptive or analytical) and interpret its results correctly;
- To develop a scientific paper, including the license thesis, and to capitalize on its results;
- To assess the role and importance of biostatistics and the research methodology in the modern context of "evidence based medicine";
- To have openness to lifelong learning.

Note. Study outcomes (are deduced from the professional competencies and formative valences of the informational content of the discipline).

VIII. STUDENT'S SELF-TRAINING

No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Working with information sources	To read the material carefully for the corresponding theme from the textbook. To answer to the questions given at the end of each theme. Formulation of conclusions.	The ability to extract the essentials, the ability to interpret and to present the didactic material.	During the semester
3.	Solving the practical problems	Practical problems are solved after analyzing the information on the topic in the textbook. Some practical problems can be solved on the computer with a statistical package EpiInfo or MS Office EXCEL in the computer room of the Department.	Solving the problems of the situation, the quality of conclusions.	During the semester

IX. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

- ***Teaching and learning methods used***

For more effective learning in the course “Descriptive and inferential statistics in medical research”, both traditional methods (exposure, conversation, exercise) and those considered today to be more effective for university education (active based learning, case study, project method, modeling) are used. Practical methods use frontal methods, individual activity methods, group activity methods. Practical training within the course uses computer-assisted training / self-training (EpiInfo, MS Office EXCEL).

- ***Applied teaching strategies / technologies*** *(specific to the discipline)*

Communication Technologies such as PowerPoint presentations are used during the theoretical lectures and practical seminars.

- ***Methods of assessment*** *(including the method of final mark calculation)*
  - ✓ ***Current***:

The current assessment during the semester includes a midterm test (the theoretical part) and a practical problem solved by a student in a statistical package EpiInfo/EXCEL (the practical part). The latter represents the assessment of the practical skills of a student.

Theoretical part:

- Midterm test - Descriptive and inferential statistics

Practical part:

- Solving a practical problem in the biomedical field with the use of descriptive and inferential statistics + attendance of the theoretical lectures.

The mark for the practical part of the current assessment is complex and consists of two parts: the mark for the practical problem (coefficient is 0.9) and the mark for the attendance of the theoretical lectures (coefficient is 0.1). The semester mark is calculated as the average of the midterm test and the mark for solving a practical problem.

***Final**:* differentiated colloquium.

The differentiated colloquium for the discipline "Descriptive and inferential statistics in medical research" represents the grid-test. It includes **30** random questions from each of the studied themes with 40% single-choice questions and 60% multiple-choice questions. The student has at his/her disposal 30 minutes to answer to the grid-test. Those students who have the semester mark less than 5.0 and / or did not recover their absence(s) for the practical seminars are not admitted to the final examination.

The **final mark** is calculated as the average of the semester mark and the mark for the test-grid obtained at the differentiated colloquium.

Method of mark rounding at different assessment stages

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	**2**	**F**
3,01-4,99	**4**	**FX**
5,00	**5**	**E**
5,01-5,50	**5,5**	
5,51-6,0	**6**	
6,01-6,50	**6,5**	**D**
6,51-7,00	**7**	
7,01-7,50	**7,5**	**C**
7,51-8,00	**8**	
8,01-8,50	**8,5**	**B**
8,51-8,00	**9**	
9,01-9,50	**9,5**	**A**
9,51-10,0	**10**	

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations.

X. RECOMMENDED LITERATURE:

A. Compulsory:

1. **RAEVSCHI E.**, 2012. *Biostatistics & Research Methodology*. Methodological recommendation for medical students. Chisinau: Medicina, 94 p.
2. **RAEVSCHI E., PENINA O.**, 2016. *Reporting of Findings of Medical Research: Term Project Presentation Guide*. Methodological recommendations for the course in Biostatistics and Research Methodology for medical students. Chisinau: Medicina, 27 p. (accesibil în format electronic pentru studenți prin SIMU).

B. Additional

1. **GLASER ANTHONY N.**, 2013, *High-Yield Biostatistics, Epidemiology, and Public Health*, Fourth edition, Philadelphia, LWW, 168 p.
2. **TINTIUC D., BADAN V., RAEVSCHI E.**, et al., 2011. *Biostatistica şi Metodologia Cercetării Ştiinţifice* (suport de curs). Chișinău: Medicina, 344 p. (în română).
3. **URDAN T. C.**, 2010, *Statistics in Plain English, Third Edition*, 3 edition, New York, Routledge, 224 p.