GENERAL INFORMATION		
Course name	**Medical Statistics 1**	
Course director	**Assoc. Prof. Mario Štefanić, MD, PhD**	
Assistants	Prof. Maja Miškulin, MD, PhD Asst. Prof. Ivan Miškulin, PhD	
Study program	**Integrated undergraduate and graduate university study program Medical Studies in German**	
Course status	Elective	
Year of study, semester	5th year, 9th semester	
Credits allocated and form of instruction	ECTS student workload	**1**
	Number of teaching hours (L+S+E)	**15** (5+0+10)

COURSE DESCRIPTION

Course objectives

The objective of the course is to teach students a systematic approach to the organization, processing and interpretation of data in medicine and healthcare. To learn the basics of the corresponding, critical and competent choice of methods for presentation and statistical analysis of data. To understand the importance of appropriate processing, analysis and presentation of data in scientific and technical literature.

Course requirements

There are no specific requirements for this course except those defined in the study program curriculum.

Learning outcomes at the Programme level

1.1., 2.2., 3.4., 3.5., 4.2.

Expected learning outcomes *(5-10 learning outcomes)*

Knowledge

1. Types of research and choosing the appropriate analytical research design
2. Differentiating between types of data, i.e. variables and applying appropriate measuring scales
3. Analysis, interpretation and presentation of data in tables and graphs
4. Choosing appropriate parameters of empirical distribution, their description, calculation method and interpretation:

-Measures of central tendency
-Measures of variation

5. Description and identification of the basic theoretical distributions:

-Binomial
-Poisson
-Normal

6. Applying the method of generalization from sample to population. Calculation of standard error, confidence interval.
7. Understanding the theory of hypothesis testing – the significance of differences, probability, type I and type II errors, power of a statistical test
8. Knowledge of qualitative data analysis methods
9. Application of appropriate statistical tests

-Presentation and analysis of contingency tables Chi-2 test, McNemar test, exact tests. Carmer V, Cohen κ. Relative and attributable risk, odds ratio.

10. Assessment validity:

-Sensitivity, specificity, positive predictive value, negative predictive value.

Skills

1. Identifying different types of data and proper use of measurement scales
2. Utilizing selected software for data analysis
3. Preparation, uploading and entry of data
4. Graphical representation of empirical distribution
5. Choosing and drawing up the statistical design of a study
6. Analysis of the empirical distribution parameters: computer-aided calculation of the arithmetic mean, variance, standard deviation, coefficient of variation, range, quantile, median, interquartile range and mode
7. Computer-aided analysis of contingency tables. Chi-2, Fisher exact test. McNemar test. Φ, Carmer V, Cohen κ.
8. Calculation of the relative and attributable risk, calculation of the odds ratio
9. Analysis of diagnostic tables. Calculation of the sensitivity, specificity, positive and negative predictive values of a diagnostic test (PPV, NPV)

Course content

Introduction. Types of data. Empirical distributions. Classification of variables and levels of measurement. Sample and population. Basics of sampling theory, sample types, representativeness. *Types of data.* Preparation of data for computer processing. Students' individual work on a computer. *Description of data distribution.* Parameter and statistics. Measures of center, spread and shapes. Random variable, theoretical distributions. Discrete and continuous random variables, probability function and the distribution function of a random variable. Binomial, Poisson, normal and z-distribution. *Description and presentation of empirical data distribution.* Students' individual work on a computer. Presentation of data. Ways (text, table, graph), rules and errors in presentation. *Basic rules for calculation of probability.* Probability space, chance occurrences. Definition of probability. Inverse probability, addition, multiplication, independent and disjoint events, conditional probability. *Statistical tests, P-value.* Statistical testing and inference procedure. Hypotheses. Decision errors in the testing of the H0 hypothesis, significance level, power of a test, multiple testing. *Applying the theoretical distribution in probability.* Adaptation of empirical distributions. Confidence range. Required sample size to estimate the arithmetic mean and the proportion. *Analysis of contingency tables*. χ2-test. Use, conditions: evaluating agreement with a known distribution, evaluating the variance of distribution in independent samples, evaluating the variance in dependent samples (McNemar test, Stuart-Maxwell). Exact tests. Risk assessment. Standard error of a proportion. Diagnostic tables. Sensitivity, specificity, PPV, NPV.

Form of instruction		
	☒ lectures	☐ individual assignments
	☐ seminars and workshops	☐ multimedia and Internet
	☒ exercises	☐ laboratory
	☐ distance learning	☐ mentoring activities
	☐ field course	☐ other

Student obligations

Come to class prepared by studying the recommended literature for each unit and actively participate in all forms of instruction. The student must participate in at least 70% of classes to pass the course.

Monitoring student learning

Attendance	x	Active participation	x	Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project		Continuous assessment		Paper		Practical work	x
Portfolio							

Assessment and evaluation of students during class and on the final exam

Students' performance will be evaluated during class and on the final exam. Students are evaluated numerically and descriptively (insufficient (1), sufficient (2), good (3), very good (4), excellent (5)). During classes, a student can earn a maximum of 100 points. Students can earn a maximum of 20 points during classes through different types of activities. On the final exam, students can earn a maximum of 80 points. The final grade represents the sum of the points earned during classes and on the final exam.

Mandatory reading

1. Weiss C. Basiswissen Medizinische Statistik. Springer-Verlag Berlin Heidelberg; Auflage: 5, 2010

Additional reading

1. Bortz J, Lienert GA. Kurzgefasste Statistik für die klinische Forschung (Springer-Lehrbuch). Springer, Auflage: 2, 2003
2. Rowe P. Statistik für Mediziner und Pharmazeuten (Verdammt Clever!). Wiley-VCH Verlag GmbH, 2012
3. Daniel WW. Biostatistics: a foundation for analysis in the health sciences. John Wiley & Sons Inc, 1999

The number of copies of mandatory reading in proportion to the number of students currently taking this course

Title	*Number of copies*	*Number of students*
Weiss C. Basiswissen Medizinische Statistik. Springer-Verlag Berlin Heidelberg; Auflage: 5, 2010	A purchased license for online textbooks shall be used https://bfdproxy48.bfd-online.de/login.htm?back=http%3a%2f%2fpartner.bfd-online.info.bfdproxy48.bfd-online.de%2fameos%2fbfdAboGateway%3faboId%3d264117 Access will be granted to all students enrolled in the study program	

Quality monitoring methods ensuring the acquisition of knowledge upon completion, skills and competences

The quality of course performance is monitored through an anonymous student survey on the quality of the organization and conduction of classes, the course content and the work of professors. The usefulness of the lectures from the students' perspective, the curriculum content, the professor preparedness, the clarity of the presentation, the amount of new content and the quality of the presentation are evaluated. The curriculum and its execution are administratively compared. The participation of students in lectures and exercises, as well as the excuses for missing classes, are controlled and analyzed.