COURSE DESCRIPTION CARD - SYLLABUS

Course name
Elements of Statistics

Course

Field of study
Pharmaceutical Engineering
Area of study (specialization)
-
Level of study
First-cycle studies
Form of study
full-time

Year/Semester
1/2
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
Prof. Jerzy A. Moczko, MD, PhD

Responsible for the course/lecturer:
Magdalena Roszak, PhD

Izabela Miechowicz, PhD

Agata Pruciak, MSc

Prerequisites

Knowledge of information technologies at high school level.

Course objective

To familiarize students with issues related to the statistical analysis of experimental pharmaceutical data.

V.1: Acquiring knowledge of the basic concepts of statistics and probability theory.

V.2: Acquiring of knowledge in the field of scientific research methodology.

V.3: Acquiring of knowledge in the selection of appropriate methods of statistical analysis.

K.2: Developing readiness for self-education, raising professional and IT competences.

U.1: Developing the ability to select the appropriate sample, self collecting, processing and analysis of pharmaceutical data.

U.2: Developing skills to analyze measurement results using computational environments, and then interpreting the results obtained.

U.3: Developing the ability to select the appropriate statistical test for a given research problem.

U.4: Developing skills in planning, organizing and working in both a research team and individually.

K.1: Developing the skills to work in a research team.

K.2: Developing readiness for self-education, raising professional and IT competences.

Course-related learning outcomes

Knowledge

K_W6 (P6S_WG, P6U_W). Has knowledge in the field of computer science to the extent needed to formulate and solve simple computational and design tasks related to pharmaceutical engineering

K_W2 (P6S_WG, P6U_W). Has knowledge of mathematics to the extent that allows the use of mathematical methods to describe chemical processes and perform calculations needed in engineering practice

Skills

K_U25 (P6SF_UK, P6S_UO, P6U_U). In a professional and research environment, he can plan and organize individual and team work, and work both individually and as a team.

K_U24 (P6U_U, P6S_UU). Has the ability to self-study.

K_U19 (P6SF_UW, P6ST_UW, P6S_UW). Uses computer programs to support the implementation of typical tasks in pharmaceutical engineering; uses information technology to describe phenomena and data analysis.

Social competences

K_K1 (P6SF_KK, P6S_KK). He is ready to critically assess his knowledge, understands the need for further education, supplementing disciplinary knowledge and raising his professional, personal and social

competences, understands the importance of knowledge in solving problems and is ready to consult experts.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
The condition of obtaining credit for the course is:

a. activity, preparation for classes (full knowledge of previously processed material) and presence at all exercises that take place in the computer laboratory,

b. passing a test covering all the material processed during the lecture and exercises (60% threshold). The test has a practical form and is carried out using a computer with software used during classes. The results of the tests are given in the UMP IT system.

Unexcused absence at the test is equivalent to receiving an unsatisfactory grade. If you receive an unsatisfactory grade, you can correct it twice.

Programme content

LECTURE TOPICS

1. The concept of representative and unrepresentative population and sample. Measuring scales (interval, ordinal, nominal). Descriptive Statistics:

a) measures of central tendency (arithmetic, geometric, harmonic, median, modal),

b) location measures (quartiles, deciles, centiles),

c) measures of dispersion (variance, standard deviation, range, interquartile range, coefficient of variation),

d) graphic methods of data presentation (histograms, bar charts, pie charts, line charts, scatter charts).

2. Definition and calculation of the probability of occurrence of an event (the right to add and multiply probabilities, conditional probability). Theoretical and empirical distributions. Normal distribution - properties, concept of critical value and calculation of probability. Central limit theorem. Confidence interval for the arithmetic mean. Comparing confidence intervals.

3. The concept of null and alternative hypothesis (one-sided and two-sided hypotheses). First and second type error. Statistical test power. A selection of the most commonly used statistical tests for comparing the distributions applicable in medical science.

4. Study of relationships between variables (simple and multiple models, canonical analysis). Testing of linear relationship -Pearson's correlation coefficient. Study of monotonic relationship- the Spearman's rank correlation coefficient. Study of dependencies on a nominal scale.

5. Multiple regression and residue analysis. Survival analysis.

TUTORIALS in the computer laboratory

1. Basic concepts in the field of biostatistics. Descriptive statistics and central limit theorem. Introduction to testing statistical hypotheses. Selection of statistical test for comparison of two groups.

2. Selection of statistical test for 2 groups - nominal scale. Diagnostic tests - sensitivity and specificity, ROC curves, RR- relative risk, OR - odds ratio

3. Comparisons of many groups.

4. Correlation and regression.

5. Final test.

Teaching methods

1. Lecture: multimedia presentation illustrated with examples.

2. Exercises in the computer laboratory: simulations, discusses when performing tasks given by the teacher - practical exercises performed on medical databases recorded in a spreadsheet imported into statistical packages (statistical analysis and interpretation of results).

Bibliography

Basic

1. Stanisz A. Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny, tom I , StatSoft, Kraków , 2006.

2. Petrie A., Sabin C. Statystyka medyczna w zarysie , Wydawnictwo Lekarskie PZWL, Warszawa, 2006.

3. Namieśnik J., Konieczka P., Zygmunt B. Ocena i kontrola jakości wyników pomiarów analitycznych , WNT, Warszawa, 2014.

Additional

1. Stanisz A. Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny, tom II , StatSoft, Kraków, 2007.

2. Moczko J. A., Bręborowicz G.H. Nie samą biostatystyką... , Ośrodek Wydawnictw Naukowych, Poznań, 2010.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	1,6
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) [1]	35	1,4

[1] delete or add other activities as appropriate