



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Elements of statistics [S1IFar2>ES]

### Course

Field of study

Pharmaceutical Engineering

Year/Semester

2/3

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

0

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

15

### Number of credit points

1,00

### Coordinators

dr hab. inż. Katarzyna Staszak  
katarzyna.staszak@put.poznan.pl

### Lecturers

### Prerequisites

The student has basic knowledge of mathematics to the extent necessary to use mathematical methods to describe basic statistical issues and knowledge of computer science to the extent necessary to formulate and solve simple calculation and design tasks related to statistical calculations.

### Course objective

To acquire knowledge of the fundamentals of statistical processing of measurement data, including in particular the verification of experimental pharmaceutical data.

### Course-related learning outcomes

Knowledge:

1. Student has knowledge in mathematics to the extent allowing to use mathematical methods to describe chemical processes and to make calculations needed in engineering practice. [K\_W2]
2. Student has knowledge of computer science to the extent needed to formulate and solve simple computational and design tasks related to pharmaceutical engineering. [K\_W6]

Skills:

1. Student is able to plan and conduct simple experiments in the field of pharmaceutical engineering, both experimental and simulation, and interpret their results and draw conclusions. [K\_U12]
2. Student uses computer programs, supporting the implementation of tasks typical for pharmaceutical engineering; applies computer techniques to describe phenomena and analyze data. [K\_U19]

Social competences:

1. The student is ready to critically evaluate his/her knowledge, understands the need for further education, complementing the field knowledge and improving his/her professional, personal and social competences, understands the importance of knowledge in problem solving and is ready to seek expert advice. [K\_K1]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Credit of knowledge in the form of two tests for practical verification of acquired knowledge using computer software. In the case of stationary classes, credit is given in a computer laboratory, while in the case of online classes credit is given using the university's network and computer infrastructure (VPN) via the Remote Desktop Protocol (RDP) using a remote desktop connection tool.

### Programme content

The program covers the following topics:

1. Applying basic statistical concepts to real-world pharmaceutical engineering problems.
2. The distribution of the arithmetic mean.
3. Calculating basic sample characteristics.
4. Confidence interval for the expected value.
5. Creating a histogram.
6. Hypothesis tests.
7. The linear regression equation.

### Course topics

In this course, students are introduced to the theoretical foundations and perform tasks related to the application of basic statistical concepts to solve real pharmaceutical engineering problems that they may encounter in laboratory work, e.g., studying the distribution of the sample arithmetic mean, calculating basic sample characteristics, confidence interval for the expected value, creating a histogram. In addition, students perform statistical hypothesis tests, including equality of variance of two samples and equality of expected values, determine the equation of linear regression, test the significance of linear correlation, significance of free expression and compare the value of the slope coefficient with the standard, check the tolerance interval of values deviating from the determined model, use linearized regression.

### Teaching methods

Lecture in the form of multimedia presentations together with a discussion on the issues raised. In laboratory classes, joint solving of problems connected with static processing of measurement data using computer software.

### Bibliography

Basic:

1. W. Ufnalski, Excel dla chemików i nie tylko, WNT, Warszawa, 2000.
2. Internetowy podręcznik statystyki <http://www.statsoft.pl/textbook/stathome.html>
3. M. Otto, Chemometrics - Statistics and Computer Application in Analytical Chemistry (3rd Edition), Wiley VCH, Weinheim 2017. Available as e-book at Knovel e-sources on the web site of PUT library.
4. D. Bobrowski, K. Maćkowiak-Łybacka, Wybrane metody wnioskowania statystycznego, Wydawnictwo Politechniki Poznańskiej, Poznań 2006.

Additional:

1. Miller J., Miller J., Statystyka i chemometria w chemii analitycznej, PWN, Warszawa 2016.
2. A. Stanisław, Podręczny kurs statystyki, Wydawnictwo StatSoft, Kraków, 2006.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	30	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50