



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Statistics for Engineers [S1MwT1>SdI]

### Course

Field of study

Mathematics in Technology

Year/Semester

2/4

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

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

dr hab. Karol Andrzejczak prof. PP  
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### Lecturers

### Prerequisites

Student knows the basic concepts and theorems in mathematical analysis, linear algebra and probability theory. He can apply basic discrete and continuous distributions. He can use computer assistance in calculations. Student is aware of the level of his knowledge in relation to the conducted research.

### Course objective

The aim of the course is to familiarize students with selected issues of statistical inference and performing statistical calculations and visualization of results with computer support (MatLab, R, Python, Excel), as well as the ability to apply the acquired knowledge in solving engineering problems with computer support.

### Course-related learning outcomes

Knowledge:

Student has an extended and deepened knowledge of various areas of higher mathematics and a detailed knowledge of the use of statistical methods and tools in solving engineering problems;  
has an extended and in-depth knowledge of the estimation and verification of hypotheses concerning the parameters of probabilistic models;  
has a systematic knowledge of mathematical terminology and selected issues in the field of engineering

sciences related to the field of study, also in a foreign language.

#### Skills:

Student is able to use the knowledge of mathematical statistics in engineering issues; is able to formulate a technical problem and carry out detailed research using statistical, analytical or simulation methods as well as interpret the obtained results and draw appropriate conclusions.

#### Social competences:

The student is aware of the level of his knowledge in the field of research covering engineering, natural, economic and exact sciences; is aware of deepening and expanding his knowledge in order to solve newly emerging technical problems.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lectures: assessment of knowledge and skills on the basis of an oral exam in scale 50 points + 50% points obtained from laboratory exercises. Passing threshold 45% of points. Subsequent grades every 10 points. Laboratory exercises: assessment of knowledge and skills on the basis of two written tests of the studied issues. The tests are assessed on a scale of 0 to 35 points. For ongoing activity documented on e-courses, the student may obtain up to 30 points. The pass mark is 50% of the total points obtained from two tests and for activity. Subsequent grades every 10 points.

### Programme content

Update: August 22, 2022

#### Lectures:

- distributions of random variables used in statistics;
- population and sample, location and dispersion measures;
- central limit theorems and their engineering applications;
- point and interval estimation of parameters;
- determining the necessary sample size;
- testing hypotheses on expectation, variance and structure ratio in one population;
- tests for comparing expectation, variance, and structure indices in two populations;
- correlation, sample correlation coefficient, linear correlation coefficient testing, test for two correlation coefficients;
- regression, linear regression model, regression significance tested;
- non-parametric tests: independence test, goodness of fit test, sample randomness test;
- one- and two-way analysis of variance.

Laboratory exercises: discussions and solving problems with computer aided in the field of theories and models presented in the lectures and their engineering applications. Tasks provided in e-courses after each lecture.

### Teaching methods

#### Lectures:

- multimedia presentations supplemented with examples given on the board; lecture materials provided to students;
- an interactive lecture with questions to students and discussion development;
- introducing a new topic, preceded by a reminder of related content, known to students in other subjects.

#### Laboratory classes:

- use of computer software that allows students to perform tasks;
- introducing a new topic, preceded by a reminder of related content, known to students in other subjects;
- sets of tasks are made available to students electronically in advance, which enables students to prepare themselves better for classes.

### Bibliography

#### Basic

D. Bobrowski, K. Maćkowiak-Łybacka, (2006) Wybrane metody wnioskowania statystycznego, Wydawnictwo Politechniki Poznańskiej.

Jay L. Devore, Probability and Statistics for Engineering and the Sciences.

J. Koronacki, J. Mielniczuk (2001) Statystyka dla studentów kierunków technicznych i przyrodniczych.

WNT, Warszawa.

W. Kryszicki i in., (1998) Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, tom I i II, PWN, Warszawa.

Additional

D. Bobrowski, (1986) Probabilistyka w zastosowaniach technicznych, Wydawnictwo Naukowo Techniczne.

K. Andrzejczak, (1997) Statystyka elementarna z wykorzystaniem systemu Statgraphics. Wyd. PP.

T. Górecki, Podstawy statystyki z przykładami w R. Wyd. BTC.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	38	1,50