



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Descriptive and elements of applied statistics

### Course

Field of study

Engineering Management

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

10

Laboratory classes

Other (e.g. online)

Tutorials

16

Projects/seminars

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

Ph.D., Alina Gleska

Responsible for the course/lecturer:

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Faculty of Automatic Control, Robotics and  
Electrical Engineering

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### Prerequisites

Basic knowledge of elementary functions, algebraic operations, mathematical analysis and probability theory .

### Course objective

Descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data.

### Course-related learning outcomes

Knowledge

The student discusses basic concepts of descriptive statistics, including definitions of statistical



population, statistical unit, and statistical feature, and distinguishes different measurement scales [P6S\_WG\_09].

The student presents the stages of statistical research, covering the goal, subject, and space of statistical research, statistical observation, and the creation of statistical series [P6S\_WG\_16].

The student performs an analysis of classical and positional measures of location and measures of variability of the studied feature, including standard deviation and variance [P6S\_WG\_17].

The student presents principles of analyzing the co-dependence of two features, including the use of correlation diagrams and correlation tables [P6S\_WG\_18].

#### Skills

The student applies statistical methods to analyze and evaluate processes in organizations, including creating histograms, frequency polygons, and frequency curves [P6S\_UW\_01].

The student uses forecasting techniques based on statistical data, applying linear regression models [P6S\_UW\_02].

The student analyzes statistical data using measures of correlation, including Pearson's linear correlation coefficient and Spearman's rank correlation [P6S\_UW\_07].

The student performs statistical experiments and interprets the results in the context of management [P6S\_UW\_09].

#### Social competences

The student assesses cause-and-effect relationships in statistical data and applies them in the managerial decision-making process [P6S\_KK\_02].

The student develops projects using statistical analyses, considering legal, economic, and organizational aspects [P6S\_KO\_03].

The student emphasizes professionalism and ethics in the analysis and application of statistical data in management [P6S\_KR\_01].

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: written final test on the last lecture;

Tutorials: one test on the last meeting.

#### Programme content

Update: 01.09.2021r.

PRELIMINARIES (populations, observations and samples, statistical characteristics and their classification, measure scales).



STATISTICAL RESEARCH STAGES (aim, subject and space of statistical research, statistical observations and samples, statistical series and their types, statistical tables, graphs – histograms, boxplot, box-and-whisker plot).

MEASURES OF CENTRAL TENDENCY (outliers, arithmetic mean (AM), geometric mean (GM), harmonic mean (HM), relationship between AM, GM and HM, mode, median, quartiles, other quantiles).

MEASURES OF DISPERSION (average deviation, variance, standard deviation, classic coefficient of variation, range, interquartile range, interquartile deviation, order coefficient of variation).

MEASURES OF SKEWNESS (negative skew, positive skew, measures of skewness, coefficient of asymmetry, central moments of third order, sample skewness).

MEASURES OF CORRELATION FOR TWO VARIABLES (correlation series, correlation diagram, correlation table, covariance, Pearson's correlation coefficient, Spearman's rank correlation coefficient).

REGRESSION ANALYSIS (linear regression model, least squares method, nonlinear regression, multiple regression).

### Teaching methods

Lectures:

- theory presented in relation to the current knowledge of students;
- frequent initiating discussions during the lecture;
- recommending materials for self-expanding knowledge.

Tutorials:

- tasks closely related to the theory presented during the lecture;
- detailed discussion of solved tasks.

### Bibliography

Basic

1. G.A.F. Seber, A. J. Lee, Linear regression analysis. John Wiley and Sons, 2003 (Mg 179960)
2. R. Johnson, Elementary statistics. Boston: Duxbury Press, 1984 (Mg 190139)
3. E. Wasilewska, Statystyka opisowa od podstaw. Podręcznik z zadaniami. Wydawnictwo SGGW, 2015.
4. E. Wasilewska, Statystyka matematyczna w praktyce. Wydawnictwo Difin, 2015. (księg. stud. E1, W 157580)
5. I. Bąk, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak, Statystyka opisowa : przykłady i zadania. Wydawnictwo: CeDeWu, Warszawa 2015. (księg. stud. A2, W 157584)



6. W. Starzyńska, Statystyka praktyczna. Wydawnictwo Naukowe PWN, Warszawa 2012. (księg. stud. A2, W 146547)

7. M. Iwińska, B. Popowska, M. Szymkowiak, Statystyka opisowa. Wydawnictwo Politechniki Poznańskiej, 2011. (księg. stud. E1, W 130794)

8. J. Buga, H. Kassyk-Rokicka, Podstawy statystyki opisowej. Wydawnictwo: Vizja Press & IT, Warszawa 2008. (księg. stud. A2, W 119664)

9. M. Sobczyk, Statystyka. Wydawnictwo Naukowe PWN, Warszawa (1998 – księg. stud. A2, W 146934; 2007 - czytelnia)

#### Additional

1. A. Witkowska, M. Witkowski, Statystyka opisowa w przykładach i zadaniach. Wydawnictwo Uczelni Państwowej Wyższej Szkoły Zawodowej im. Prezydenta Wojciechowskiego, Kalisz 2007. (księg. stud. A2, W 123957)

2. W. Regel, Ćwiczenia z podstaw statystyki w Excelu. Wydawnictwo Naukowe PWN, Warszawa 2007. (księg. stud. A2, W 121127)

3. A. Aczel, Statystyka w zarządzaniu : pełny wykład (przekł.: Zbigniew Czerwiński, Wojciech Latusek). Wydawnictwo Naukowe PWN, Warszawa 2006. (księg. stud. A3, W 90872)

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for tutorials, preparation for test and final written test) <sup>1</sup>	70	3,0

<sup>1</sup> delete or add other activities as appropriate