COURSE DESCRIPTION CARD - SYLLABUS

Course name
Statistics [S2LiK1>STAT]

Course

Field of study
Aerospace Engineering

Year/Semester
1/2

Area of study (specialization)
Civil Aviation

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

The student has basic knowledge of combinatorics and theory of probability resulting from the school program. The student has basic knowledge of mathematical analysis (differential calculus of functions of one variable, differential calculus of functions of many variables, integral calculus of functions of one variable and basics of matrix algebra). He can operate a computer. He can think logically. The student is aware of the learning purpose. The student is able to apply the language of mathematics (differential and integral calculus) to describe simple problems in technology. The student has the ability to self-study using modern teaching tools. Is able to obtain information from literature.

Course objective

The aim of the course is to familiarize students with selected problems of probability and mathematical statistics. Students acquire the ability to use probabilistic and statistical methods to describe technical issues.

Course-related learning outcomes

Knowledge:
The student knows the basic distributions of statistics from the sample. Has basic knowledge of

statistical inference: the theory of estimation, the theory of statistical hypothesis testing, the theory of regression analysis. The student knows the assumptions and the method of creating a regression model for the studied phenomenon. Has extensive knowledge of mathematical modeling. He knows the methods of applying the known statistical methods in technical sciences.
The student has ordered knowledge of terminology in the field of statistics. Has knowledge in mathematics necessary for statistical analysis

Skills:
Student can communicate using various techniques in a professional environment using formal statistical notation and concepts and definitions in the field of mathematical statistics
Student has the ability to self-study using modern teaching tools, such as remote lectures, websites and databases.
Student can obtain information from literature, the Internet, databases and other sources. He is able to obtain information in the field of statistics and data analysis, interpret and draw conclusions from them and create and justify opinions
Student can use statistical formulas and tables.

Social competences:
Student understands the need to learn throughout life; can inspire the learning process of other people.
Student is ready to critically evaluate his knowledge and content, recognize the importance of knowledge in solving cognitive and practical problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Assessment of knowledge and skills acquired during the lecture is verified based on a written exam (50%) and current activity (50%).
Tutorials: Assessment of knowledge and skills acquired during the exercises is verified based on a final colloquium and current activity assessment.

Programme content

LECTURES
1. Random variable and its distribution. Cumulative distribution function and its properties. Types of random variables. Parameters of the distribution of a random variable. Quantile function.
2. Numerical characteristics of a random variable: expected value, quartiles, deciles, variance, standard deviation, ordinary and central moments. Standardization of a random variable.
3. Definitions, properties and applications of distributions: Bernoulli, binomial, uniform, exponential, normal. Computer-aided calculations.
4. Scope of applications of mathematical statistics. Basic statistics. General population, statistical features, random sample, statistical inference. Theoretical distribution and empirical distribution. Point estimation, estimator and its good properties. Distribution of the arithmetic mean and sum of random variables. Central limit theorems. Student's t-distribution. Distribution of fractions of distinguished elements. Chi-square distribution.
5. Series: detailed, positional, frequency. Interval estimation of the expected value, variance, index of distinguished elements in one and two populations. Minimum sample size.
6. Statistical hypotheses. Procedure for verifying a statistical hypothesis. Construction of a statistical test. Comparison of parametric tests for one and two populations.
7. Pearson chi-square test of goodness of fit. Goodness of fit test for multinomial distribution. Chi-square test of independence. Randomness test.

TUTORIALS
As an integral part of the education module, they concern topics presented in lectures and consist in solving problems and tasks concerning the application of presented theoretical issues.

Course topics

T01: Random Variables
T02: Numerical Characteristics of a Random Variable
T03: Review of Basic Distributions of Random Variables

T04: Basics of Statistical Inference
T05: Parameter Estimation
T06: Parametric Significance Tests
T07: Nonparametric Significance Tests

Teaching methods

The lecture conducted with a multimedia presentation supplemented with examples given on the board. The lecture was conducted in an interactive way with the formulation of current questions to a group of students.
Students actively participate in the lecture. Each presentation of a new topic is preceded by a reminder of content related to the issue (content known to students in other subjects).
Tutorials: All students receive electronically a list of tasks that are solved in the nearest tutorials. The theory, formulas and charts they need are provided electronically. Tasks are solved by students. Frequent homeworks activate students to work systematically.

Bibliography

Basic
1. Devore Jay L., Probability and Statistics for Engineering and the Sciences.
2. D. Bobrowski, (1986) Probabilistyka w zastosowaniach technicznych, Wydawnictwo Naukowo Techniczne.
3. D. Bobrowski, K. Maćkowiak-Łybacka, (2006) Wybrane metody wnioskowania statystycznego, Wydawnictwo Politechniki Poznańskiej.
4. Aczel Amir D., Statystyka w zarządzaniu. Wydawnictwo Naukowe PWN, Warszawa.
5. W. Kordecki (2010) Rachunek prawdopodobieństwa i statystyka matematyczna, Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS.

Additional
1. Andrzejczak K., Statystyka elementarna z wykorzystaniem systemu Statgraphics. Wyd. PP, Poznań 1997.
2. Plucińska A., Pluciński E., Probabilistyka, Wydawnictwo WNT, Warszawa.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00