COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematical statistics

Course

Field of study

Aerospace Engineering

Year/Semester

2/2

Area of study (specialization)

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:

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.

Student ma świadomość celu uczenia się.

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, statistical packages also in the R program environment

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, technical calculations and specialized software (R program)

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 on the basis of a written test.

Laboratories: The assessment of knowledge and skills acquired in laboratories is verified on the basis of written tests.

Programme content

LECTURE

1. Random variable, cumulative distribution function, expected value, variance.

2. Discrete random variable. Discrete distributions.

3. Continuous random variable. Continuous distributions.

4. Point estimation. Interval estimation.

5. Significance tests for the mean, variance, fractions (one population)

6. Significance tests for mean, variance, fractions (two populations)

7. Analysis of variance. Multiple comparison tests (Fisher Test, Tukey Test, Dunnet Test).

8. Linear regression. Testing the significance of regression.

LABORATORY CLASSES

1. Introduction to the R software (R program). Variables. Vectors. Matrices. Data loading. Diagrams.

2. Random variable, cumulative distribution function, expected value, variance.

3. Discrete random variable. Discrete distributions.

4. Continuous random variable. Continuous distributions.

5. Descriptive statistics from the sample.

6. Point estimation. Interval estimation.

7. Significance tests for the mean, variance, fractions (one population)

8. Significance tests for mean, variance, fractions (two populations)

9. Analysis of variance. Multiple comparison tests (Dunnet Test).

10. Correlation coefficient from the sample. Testing the linear correlation coefficient. Spearman's rank correlation coefficient. Kendall's correlation coefficient.

11. Linear regression. Multiple regression. Testing the significance of regression.

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).

Laboratories: All students receive electronically a list of tasks that are solved in the nearest laboratories. The theory, formulas and charts they need are provided electronically. Tasks are solved by students

using the R software and on the board with the active participation of students. Students are taught to use the R program by a teacher. Frequent tests activate students to work systematically.

Bibliography

Basic

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

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

3. J. Koronacki, J. Melniczuk (2001) Statystyka dla studentów kierunków technicznych i przyrodniczych. WNT, Warszawa.

4. W. Kordecki (2010) Rachunek prawdopodobieństwa i statystyka matematyczna, Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS.

5. H. Jasiulewicz, W. Kordecki, (2003) Rachunek prawdopodobieństwa i statystyka matematyczna, Przykłady i zadania Oficyna Wydawnicza GiS

6. T. Górecki (2011), Podstawy statystyki z przykładami w R, Wydawnictwo BTC

Additional

1. Plucińska A., Pluciński E., Probabilistyka, Wydawnictwo WNT, Warszawa

2. R. L. Scheaffer, J. T. McClave (1995) Probability and Statistics for Engineers, Duxbury

Breakdown of average student's workload

	Hours	ECTS
Total workload	65	2,0
Classes requiring direct contact with the teacher	45	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests, preparation for passing the lecture) [1]	20	1,0

[1] delete or add other activities as appropriate