COURSE DESCRIPTION CARD - SYLLABUS

Course name
Statistics [S2LiK2P>STAT]

Course

Field of study
Aerospace Engineering

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
practical

Level of study
second-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

3,00

Coordinators

dr Ewa Bakinowska
ewa.bakinowska@put.poznan.pl

Lecturers

Prerequisites

The student has basic knowledge of combinatorics and theory of probability. 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 mathematical statistics. Students acquire the ability to use probabilistic and statistical methods to describe technical issues.

Course-related learning outcomes

Knowledge:
1. has knowledge in the field of mathematics, including algebra, analysis, theory of differential equations, necessary for numerical solving of boundary problems, inverse problems, optimization,

statistical analyzes

Skills:
1. has the ability to self-educate with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books
2. is able to communicate using various techniques in the professional environment and other environments using the formal notation of concepts and definitions of the scope of the study field
3. understands the need for lifelong learning; can inspire and organize the learning process of other people

Social competences:
1. Is ready to critically evaluate the knowledge and content received, recognize the importance of knowledge in solving cognitive and practical problems, and consult experts in case of difficulties in solving the problem on its own

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 exam.
Laboratory: The assessment of knowledge and skills acquired in tutorials is verified on the basis of written tests.

Programme content

1. Introduction to the R environment.
2. Discrete distributions.
3. Continuous random variable.
4. Elements of descriptive statistics.
5. Estimation.
6. Statistics from the sample.
7. Significance tests for one population
8. Significance tests of two populations
9. Two-dimensional random variable.
10. Correlation analysis.
11. Regression analysis.
12. Variance analysis.
13. Non-parametric tests.

Course topics

LECTURES
1. Introduction to the R environment. Random variable, distribution function, expected value, variance.
2. Discrete distributions.
3. Continuous random variable.
4. Continuous distributions. Distribution of mean and sum of random variables
5. Elements of descriptive statistics.
6. Estimation. Sample statistics.
7. Significance tests for mean, variance, fractions (one population)
8. Significance tests for mean, variance, fractions (two populations)
9. Two-dimensional random variable. Independence of random variables.
10. Pearson's linear correlation analysis. Test for two correlation coefficients. Test for multiple correlation coefficients.
11. Linear regression. Regression significance testing.
12. Multiple correlation coefficient. Multiple regression. / Optional: Rank correlation coefficients (Spearman and Kendall).
13. Analysis of variance (ANOVA).
14. Non-parametric tests.
15. Complementary knowledge / Optional: Generalized linear model. Logistics model.
LABORATORY

Data analyzes performed in the R environment
1. Introduction to the R environment.
2. Discrete distributions in the R environment.
3. Continuous random variable.
4. Continuous distributions. Distribution of mean and sum of random variables. Visualizations in the R environment.
5. Elements of descriptive statistics.
6. Two-dimensional data, covariance matrix, correlation matrix of sample.
7. Test No. 1
8. Significance tests for mean, variance, fractions (one population)
9. Significance tests for mean, variance, fractions (two populations)
10. Pearson's linear correlation analysis. Significance testing.
11. Linear regression. Regression significance testing.
12. Multiple regression. Significance testing.
13. Test No. 2
14. Analysis of variance (ANOVA).
15. Complementary knowledge (Revision test)

Teaching methods

The lecture conducted with a multimedia presentation. 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.
Laboratory: Students receive electronically a list of tasks that are solved in laboratories. Theory, formulas and charts are provided in eCourses. The tasks are solved with the active participation of students. Independent tasks encourage 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

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	75	3,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	1,00