COURSE DESCRIPTION CARD - SYLLABUS

Course name
Statistics [S1SI1E>STAT]

Course

Field of study
Artificial Intelligence

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

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

5,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge in mathematical analysis, algebra of sets and probability theory

Course objective

The aim of this course is to give the opportunity to learn and discuss basic problems of probability theory and methods of statistical inference. Presented material should give the opportunity to solve selected engineering problems.

Course-related learning outcomes

Knowledge:
1. Student has extended and detailed knowledge of mathematics and mathematical statistics, forming theoretical principles appropriate to formulate and solve tasks related to problems of informatics, especially modelling of artificial intelligence and data analysis
2. Student has systematic basic knowldege, based on strong theoretical methodology, related to programming with the use of statistical softwares

Skills:

1. Student is able to get information from many respective sources, to analyze and iterpret them, with full justification
2. Student is able to form and solve complex problems of informatics and artificial intelligence with the use of respcective methods (analytical, simulation or experimantal approach)
3. Student is able to plan and to carry out experiments, including measurements and simulations, to interpret the results and draw conclusions
4. Student is able to collect, analyze and process data of various types, to secure them and perform statistical inference, that can be used to solve a wide specturm of problems that appear in informatics and artificial intelligence, including their industrial, business and administrative specificity

Social competences:
1. Student is aware of importance of the knowldedge and scientific research in informatics and artificial intelligence in solving practical problems that appear in functioning of units, companies, organizations and the whle society
2. Student knows the examples of malfunctioning systems of artificial inteligence, that would provide to economic, social or environmental loss; takes responsibility for the reliability of working results and their interpretation

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures - written test based on the material presented during the lectures; the student has to collect at least 50% of possible points;

Laboratory classes - two tests comprising probability theory and mathematical statistics; the student has to collect at least 50% of possible points from each test; the first test is scheduled for the eighth class, and the second one for the last class in the semester

Programme content

1. Elements of descriptive statistics
2. Random variables
3. Sampling distributions
4. Statistical inference related to one and many populations
5. Correlation and regression analysis
6. Goodness-of-fit chi-square tests
7. Nonparametric tests

Course topics

1. Elements of descriptive statistics
2. Random variables - probability distribution, cumulative distribtuion, expectation, standard deviation, binomial distribution, exponential distribution, normal distribtuion
3. Sampling distributions - Student t-distribution, chi-square distribution
4. Statistical inference: point and interval estimation for single population, hypothesis testing, comparison of two populations, one- and two-ways analysis of variance (ANOVA)
5. Correlation and regression analysis - Pearson correlation coefficient, linear regression, test for significance of regression, curvilinear and multiple regression
6. Goodness-of-fit chi-square tests - for frequency distribution, normality and for independence of variables (contingency tables)
7. Nonparametric tests - Wilcoxon sum rank test and Mann-Whitney test, Wilcoxon signed rank test, Kruskal-Wallis test, Friedman test, Spearman correlation coefficient, Spearman test of independence

Teaching methods

Lectures (multimedia presentations) - presenting the theory connected with a current students' knowledge, presenting a new topic preceded by a reminder of related content known to students from other subjects

Laboratory classes - solving examples with the use of R package, discussions in groups, applications of statistical methods to solve real problems in groups an individually

Bibliography

Basic
1. Krysicki, W., J. Bartos, W. Dyczka, K. Królikowska and M. Wasilewski: Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, wydanie 8. PWN Warszawa, 2012
2. Bobrowski, D. and K. Maćkowiak-Łybacka: Wybrane metody wnioskowania statystycznego. Wyd. PP, Poznań, 2004

Additional
1. Devore, J.L.: Probability and Statistics for Engineering and Sciences, Brooks/Cole, 2012
2. Ross, S.M.: Introductory Statistics, Elsevier, 2010

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50