



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Statistics

Course

Field of study

Artificial Intelligence

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

english

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Katarzyna Filipiak

Responsible for the course/lecturer:

Institute of Mathematics

Poznań University of Technology

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 knowledge, 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 interpret them, with full justification
2. Student is able to form and solve complex problems of informatics and artificial intelligence with the use of respective methods (analytical, simulation or experimental 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 spectrum 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 knowledge and scientific research in informatics and artificial intelligence in solving practical problems that appear in functioning of units, companies, organizations and the whole society
2. Student knows the examples of malfunctioning systems of artificial intelligence, 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

Lectures:

1. Elements of descriptive statistics
2. Probability theory - definition of probability and its properties, independence, conditional probability, total probability, Bayes theorem
3. Discrete random variable - basic definitions, probability distributions (Bernoulli, binomial, Poisson), cumulative distribution function, expectation and standard deviation, fraction



4. Two-dimensional discrete random variable
5. Continuous random variable - basic definitions, probability distributions (uniform, exponential, normal) cumulative distribution function, expectation and standard deviation
6. Statistical inference: statistics and their distributions, chi-square distribution, t-Student distribution
7. Statistical inference: point and interval estimation
8. Statistical inference: hypothesis testing
9. Comparing two or more populations
10. Correlation and regression analysis
11. Goodness-of-fit tests
12. Contingency tables

Laboratory Classes:

1. Introduction to R
2. Elements of descriptive statistics
3. Probability theory - definition of probability and its properties, independence, conditional probability, total probability, Bayes theorem
4. Discrete random variable ? basic definitions, probability distributions (Benoulli, binomial, Poisson), cumulative distribution function, expectation and standard deviation, fraction
5. Two-dimensional discrete random variable
6. Continuous random variable - basic definitions, probability distributions (uniform, exponential, normal) cumulative distribution function, expectation and standard deviation
7. Statistical inference: statistics and their distributions, chi-square distribution, t-Student distribution
8. Statistical inference: point and interval estimation
9. Statistical inference: hypothesis testing
10. Comparing two or more populations
11. Correlation and regression analysis
12. Goodness-of-fit tests
13. Contingency tables

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. Kryszicki, 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	110	5,0
Classes requiring direct contact with the teacher	60	3,0
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) ¹	50	2,0

¹ delete or add other activities as appropriate