

Field: IT
Module title: Fundamentals of probabilistics methods (B.5)
Preliminary conditions: none
Education aims: Describe methods and tools for formal description and analysis of “uncertainty” to the extent possible the practical application of selected methods of statistical inference, and computer processing of random data. Discuss discrete and continuous distributions, show how to determine its basic parameters. Explain the phenomenon of mass and investigate its characteristics by using the methods of statistical analysis.
Education outcomes: The student knows methods and tools for formal description and analysis of “uncertainty” to the extent possible the practical application of selected methods of statistical inference, and computer processing of random data. Can use a discrete and continuous distributions. He knows how to determine its basic parameters. Can describe the phenomenon of mass and investigate its characteristics by using the methods of statistical analysis.
Module type and contents: Introduction to probabilistic methods-Kolmogorov concept of probability space: events space and probability as a set function on a sigma algebra of events. Classification of probabilistic models: discrete, conditional (dependence and independence, conditional probability, Bayes formula). Concept of probability distributions: cumulative distribution function, probability density function. Concept of random variable: discrete and continuous. Distributions and their parameters: mean value, variance (standard deviation) and moments. Examples of probability distributions: binary distribution, binomial distribution, Poisson, uniform distribution, triangular, Gaussian distribution, chi-square, t-Student. Multi-dimensional random variable-concept, joint probability density function and marginal probability density function, parameters of two-dimensional random variable (covariance matrix, correlation). Limit theorems: weak and strong law of large numbers, central limit theorem. Introduction to mathematical statistics: fundamental concepts (sample, random sample, population) and methods of statistical investigations. Empirical cumulative distribution, histogram. Introduction to estimation theory. Statistical inference: hypothesis testing: fundamental concepts (non-parametric tests, hypothesis, first-order and second-order error, level of significance). Examples of significance tests. Statistical tables. Statistical analysis of data on the example of linear regression.
Educational methods: Lessons, classes.
Assessment methods: Examination.
ECTS credits: 6
Students workload (hs.): 150
Form Number of hours: 30
Author of a module: Ryszard Rębowski, PhD
Module language: english