



Course title: **PROBABILITY METHODS AND STATISTICS**

ECTS credit allocation (and other scores): **5**

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English /Polish

Number of hours per semester: 30 lectures + 30 classes = 60 hours

Course coordinator/ Department and e-mail: Adam Lecko/ WMil, alecko@matman.uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES:

Definition of the probability. Conditional, complete probability, formula of Bayes. Examples of applications. Random variables. Appointing the distribution of a random variable. Appointing of basis parameters of random variables. Estimating probabilities for chosen distributions. Laws of great numbers. Examining the property of sequence of random variables. Theorem of Poisson, theorem of Laplace. Stochastic processes. Checking the property and appointing parameters of the stochastic process. Fixing the empirical distribution. Estimation. Appointing point estimators. Structure of confidence intervals. Tests of the significance for the value of averages and the variance. Linear regression.

LECTURES:

Event, acting on events. Definition of the probability. Conditional probability, complete probability, formula of Bayes. Random variables. Distribution of a random variable. Parameters of random variables. Basis of random variables. Function of random variables. Distribution Chi-kwadrat, distribution of t-Studenta and F-Snedecora. Sequences of random variables. Laws of great numbers. Central border theorem. Definition of the stochastic process. Average value and variance of stochastic process. Process of Poisson, normal process, process of Wiener. Processes of Markow, processes of the diffusion. Sample and population. Distribution row. Empirical distribution. Definition of estimator. Criteria of the optimum of estimators. Estimators of basic parameters of random variables. Confidence of intervals for average and variance. Tests of the significance for the value of averages and the variance. Coefficient of correlation. Linear regression. **ĆWICZENIA:** Definition of the probability. Conditional, complete probability, formula of Bayes. Examples of applications. Random variables. Appointing the distribution of a random variable. Appointing of basis parameters of random variables. Estimating probabilities for chosen distributions. Laws of great numbers. Examining the property of sequence of random variables. Theorem of Poisson, theorem of Laplace. Stochastic processes. Checking the property and appointing parameters of the stochastic process. Fixing the empirical distribution. Estimation. Appointing point estimators. Structure of confidence intervals. Tests of the significance for the value of averages and the variance. Linear regression.

LEARNING PURPOSE

Getting to know the basic models of mathematical statistics in the field of the theory of estimation and verification of hypotheses. The ability to analyze and apply the acquired knowledge in practice to problems requiring statistical processing of data, illustrating issues related to the field of study. Practical implementation of known statistical models.

On completion of the study programme the graduate will gain:



Knowledge:

The student lists the basic concepts and formulas in the field of combinatorics and the calculus of probability; Lists methods of verification of statistical hypotheses; Lists the basic concepts of mathematical statistics and methods of statistical inference. Discusses selected random experiments and mathematical models with probability distributions. Presents the basics of point and interval estimation theory

Skills:

The student conducts simple statistical inferences, also with the use of computer tools; Uses statistical characteristics of the population and their sample equivalents; Determines parameters of the distribution of a random variable with a discrete and continuous distribution; Uses limit theorems and laws of large numbers to estimate probabilities.

Social Competencies:

The student actively participates in the selection of appropriate statistical models for the problem under consideration. Expresses evaluation of the results obtained.

BASIC LITERATURE

1. Plucińska A., Pluciński E, Probabilistyka, Wyd. PWN, R. 2000

SUPPLEMENTARY LITERATURE

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 2,6 ECTS points,

Student's independent work: 2,4 ECTS points,



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