COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Statistics [S1MNT1>SM]

Course

Field of study
Mathematics of Modern Technologies

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Probability theory, differential and integrals calculus for the functions of one and more variables, matrix algebra.

Course objective

The aim of this course is to give the opportunity to learn and discuss basic problems of mathematical statistics, including selected problems ofprobability theory as wellas the properties ofstatisticsand statistical methods used for the experimental data inference. Presented material should give the opportunity to solve selected engineering problems.

Course-related learning outcomes

Knowledge:
• the student knows and understands to an advanced degree selected branches of mathematics and has detailed knowledge of the applications of mathematical methods and tools in engineering and technical sciences [K_W01(P6S_WG)];
• the student knows and understands the concepts, theorems and methods for mathematical modeling [K_W02(P6S_WG)].

Skills:
• the student is able to use the knowledge of higher mathematics [K_U01(P 6S_UW)];
• the student is able to build and analyze simple mathematical models [K_U02(P6S_UW)];
• the student is able to work individually and in a team, as well as cooperating with others; he/she is able to estimate the time needed to complete the commissioned task; he/she is able to develop and implement a work schedule ensuring that the deadline is met [K_U16(P6S_UO)];
• students are able to independently plan and implement self-education in order to improve and update their competencies [K_U17(P6S_UU)];

Social competences:
• the student is ready to critically evaluate the level of his/her knowledge in relation to the conducted research in science, natural sciences and engineering [K_K01(P6S_KK)];
• the student is ready to deepen and broaden his knowledge to solve newly created technical problems [K_K02(P6S_KK)];
• thestudentisreadytofulfillhis/hersocialroleasagraduateofatechnicaluniversity,toconveypopular science content and to identify and solve basic problems related to the field of study [K_K05(P 6S_KR)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: theoretical and practical exam based on the lectures and tutorials material;

Tutorials: two tests verifying practical knowledge.

Programme content

• selected topics on probability theory - revisited
• statistics and their distributions
• estimation theory
• theory of testing hypotheses

Course topics

• selected topics on probability theory - revisited
 - mass and probability distribution functions of the random variable and the random vector
 - multivariate distribution and their parameters, the properties of the multivariate normal distribution (revisited)
• statistics and their distributions
 - statistics and the families of probability distributions
 - sufficient statistics
 - Fisher information
 - ancillary statistics and completeness
• estimation theory
 - the properties of estimators
 - best estimators
 - estimation methods
 - consistent estimators
 - interval estimation
• theory of testing hypotheses
 - introduction to the theory of hypothesis testing
 - the most powerful tests
 - unbiased and invariant tests
 - likelihood ratio tests
 - compatibility and homogeneity tests

Teaching methods

Lectures: 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;

Tutorials: proving selected theorems and solving examples on the blackboard as well as initiating discussions on considered topics.

Bibliography

Basic:
• Krzyśko, M. (2004). Statystyka Matematyczna. Wydawnictwo Naukowe UAM w Poznaniu.

Additional:
• Mukhopadhyay, N. (2000). Probability and Statistical Inference. Marcel Dekker, Inc., New York.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	63	2,50