STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematical statistics		**1010341761010349401**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics in technology	**general academic**	**3 / 6**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours					No. of credits
Lecture: **30**	Classes: **15**	Laboratory: **15**	Project/seminars: **-**		**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)
the sciences	**3 100%**
Mathematical sciences	**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	probability theory, differential and integrals calculus for the functions of one and more variables, matrix algebra, R software (basic skills)
2	**Skills**	Skills to logical thinking, using method of calculus, working with R software
3	**Social competencies**	Understanding of the own knowledge limits and motivation for further education, an ability to work in a team

Assumptions and objectives of the course:

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

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. The student has knowledge about basic theorems used in probability theory and mathematical statistics - [K_W03]
2. The student has knowledge about methods of proving theorems and determining the properties of statistical variables, as well as the techniques of statistical inference - [K_W01, KW02]
3. The student is able to write algorithms for solving the problems of mathematical statistics - [K_W05]

Skills:

1. The student can apply basic probability distributions and theorems to show the properties of statistics and can describe methodology of statistical inference - [K_U16]
2. The student can use statistical measures and estimators for statistical analysis of experiments, with the use of analytical methods as well as computer tools - [K_U17]

Social competencies:

1. Understanding of the own knowledge limits and motivation for further education - [K_K01]
2. Ability of formulating questions precisely in order to deepen his own understanding of a given subject or ability to recognize missing elements of reasoning - [K_K02]

Assessment methods of study outcomes

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- Practical course (exercises) test
- Laboratory course test / project
- Theoretical and practical exam based on the lecture material

Course description

1. Selected problems of probability theory: functions of random variables and random vectors, selected probability distributions and continuous distributions and their transformations, distributions of quadratic forms, Jansen inequality
2. Statistics and the families of probability distributions: statistical model, sample moments and statistics based on the central tendency measures, probability distributions of selected statistics, sufficient statistics and factorization theorem, Minimal sufficient statistics, information matrix, ancillary and complete statistics
3. Estimation theory: estimation methods, point estimation, confidence interval estimation, estimators series and consistent estimators
4. Theory of hypotheses testing: basic definitions, most powerful tests and Neyman-Pearson lemma, likelihood ratio tests, most powerful tests for models with monotone likelihood ratio property and Karlin-Rubin theorem
5. Statistical inference for large samples: maximum likelihood estimators, confidence intervals, hypotheses testing

Applied methods of education:

- 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
- practical course (exercises) - solving examples on the blackboard, discussions
- laboratory course - group programming, simulations

Update: 2017

Basic bibliography:

1. Krzyśko, M. (1996). Statystyka Matematyczna. Wydawnictwo Naukowe UAM w Poznaniu
2. Rao, C.R. (1982). Modele liniowe statystyki matematycznej. PWN Warszawa

Additional bibliography:

1. Larsen, R.J., Marx, M.L. (2006). An Introduction to Mathematical Statistics and Its Applications (4 ed.). Pearson Prentice Hall, New Jersey
2. Mukhopadhyay, N. (2000). Probability and Statistical Inference. Marcel Dekker, Inc., New York

Result of average student's workload

Activity	Time (working hours)
1. Lectures attendance (15x2 godz.)	30
2. Practical course (exercises) attendance (8x2 godz.)	16
3. Laboratory course attendance (7x2 godz.)	14
4. Consulting	2
5. Preparing to classes	2
6. Practicing to the practical course test (3 godz. + 2 godz.)	5
7. Practicing to the laboratory course test / project preparation (3 godz. + 2 godz.)	5
8. Practicing to exam (8 godz. + 2 godz)	10

Student's workload

Source of workload	hours	ECTS
Total workload	84	3
Contact hours	66	2
Practical activities	18	1

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