STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematical statistics		**1010341761010349401**
Field of study: **Mathematics in Technology**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **3 / 6**
Elective path/specialty: **-**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **30** Classes: **15** Laboratory: **15** Project/seminars: **-**		No. of credits: **3**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **the sciences**, **Mathematical sciences**		ECTS distribution (number and %): **3 100%**, **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

Lecture - theoretical and practical written exam based on the lecture material

Classes - practical written test based on the lecture material, in the 15th week of semester

Laboratory - practical test with computers, based on the lecture material, in the 15th week of semester

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

- classes - solving examples on the blackboard, discussions

- laboratory - 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. 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	30
2. Classes attendance	15
3. Laboratory course attendance	15
4. Consulting	2
5. Preparing to classes and laboratory	2
6. Practicing to the classes and laboratory course tests (2 x 3h)	6
7. Practicing to exam (8h + 2h)	10

Student's workload

Source of workload	hours	ECTS
Total workload	80	3
Contact hours	64	2
Practical activities	30	1