STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Stochastic methods and mathematical statistics	**1010342631010347255**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics	**general academic**	**2 / 3**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

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

No. of hours	No. of credits
Lecture: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**	**4**

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 %)

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student understands the role and significance of construction of mathematical reasoning. He/she knows the relationship between set theory, mathematical logic, differential and integral calculus and other branches of mathematics with calculus of probability and statistics. Knows at least one software package, used for symbolic computation, and one packet for statistical processing of data.
2	**Skills**	He / she has the ability to express mathematical content in speech and in writing, in the texts of both a theoretical and practical. Can apply basic probability distributions on technical issues. Can apply appropriate methods for parameter estimation and statistical hypotheses verification. Can use computer in determining statistics for technical data.
3	**Social competencies**	Student knows own limitation of their knowledge and understands the need for further education. Can accurately formulate questions that deepen their understanding of the topic or find missing elements of reasoning.

Assumptions and objectives of the course:

Study of basic methods of multidimensional mathematical statistics to solve some technical problems. Mastery tests for multidimensional data and the ability to use statistical packages.

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

Knowledge:

1. relating to the use of advanced probabilistic and statistical methods in technical studies - [K_W01, K_W02, K_W03, K_W04]
2. concerning the preparation of the database and perform computer-assisted statistical research - [K_W05, K_W06]

Skills:

1. constructing models and solving technical problems with one- and multi-variate distributions - [K_U01, K_U03, K_U04, KU07, KU_15, KU_16]
2. using methods of multidimensional statistics with computer-aided to study random phenomena and processes - [K_U05, KU_06, KU_09, KU_11, KU_14, KU_17]

Social competencies:

1. precise formulation of questions, aimed at deepening their understanding of advanced probabilistic and statistics methods - [K_K01, K_K02, K_K05]
2. teamwork in solving complex research projects - [K_K03, K_K04, K_K05]

Assessment methods of study outcomes

Lectures

? Continuous assessment activity for solving problems formulated for self-solving.

? Rating theoretical knowledge and practical skills shown on the written test.

Laboratories

? Current rating - granting bonuses for new skills of practical use of introduced principles and methods.

? Assessment of the knowledge and skills of its application on the basis of a report and presentation problematic tasks completed in 2-3 people groups with computer-aided.

? The final term paper evaluating the effectiveness of the use of the gained knowledge

Course description

Elements of matrix algebra. Block matrices. Multidimensional distributions. Vector of expected values. Covariance and correlation matrices and their properties. Multinomial distribution. Multivariate normal distribution and its application in linear modelling. Multidimensional data and their presentation. Measures of data distance. Correlation diagram. Parameter estimation of multivariate distributions. T-square Hotelling statistic. Tests for one and a few vectors of expected values. Tests for the covariance matrix. Tests of multivariate normality. Tests of independence several sub-vectors. Analysis of variance and its applications. Application of mathematical, statistical and spreadsheet packages in stochastic and statistical issues modelling. Review of multivariate statistics methods: discriminant analysis, principal component analysis, factor analysis.

Basic bibliography:

1. Krzyśko Mirosław, Podstawy wielowymiarowego wnioskowania statystycznego. Wydawnictwo Naukowe UAM, Poznań 2009.

2. Renczer, A.C., Methods of multivariate analysis, Wiley, New York 2002

3. Koronacki J., Ćwik J., Statystyczne systemy uczące się, Wydawnictwo Naukowo-Techniczne , W-wa 2005

Additional bibliography:

1. Morison D.F. Wielowymiarowa analiza statystyczna, PWN, W-wa 1990.

2. Brandt S., Analiza danych. Wydawnictwo Naukowe PWN, W-wa 1998.

3. Rao, C.R., Modele liniowe statystyki matematycznej. PWN, Warszawa 1982.

4. Górecki T., Podstawy statystyki z przykładami w R, Wydawnictwo BTC, Legionowo 2011.

Result of average student's workload

Activity	Time (working hours)
1. participation in lecture classes	30
2. participation in laboratory classes	30
3. consultations	2
4. preparation laboratory reports and presentation problematic tasks	15
5. preparation for laboratory exercises	8
6. familiarization with the indicated literature / teaching materials (10 pages of scientific text = 1 hr.)	10
7. exam preparation and exam	15

Student’s workload

Source of workload	hours	ECTS
Total workload	110	4
Contact hours	62	2
Practical activities	42	2