

FACULTY ELECTRONICS					
SUBJECT CARD					
Name of subject in Polish:		Matematyka dla elektroników			
Name of subject in English:		Math for Electronics			
Main field of study (if applicable):		Electronic and Computer Engineering			
Specialization (if applicable):				
Profile:		academic			
Level and form of studies:		1 st level/ full-time			
Kind of subject:		obligatory			
Subject code:		MAT001512			
Group of courses:		YES			
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	60	60			
Form of crediting	crediting with grade	crediting with grade			
For group of courses mark (X) final course	x				
Number of ECTS points	4				
including number of ECTS points for practical (P) classes		2			
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1	1			

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Recommended knowledge of differential and integral calculus of one variable and basic concepts of algebra.

SUBJECT OBJECTIVES

C1 Learning the basic concepts and methods of calculus of probability - Learning classical probabilistic distributions, their properties and applications to practical problems in various fields of science and technology

C2 to know the basic concepts and methods of calculus of mathematical statistics in practical issues in different fields of engineering applications

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge: Student...

PEU_W01 knows the basic concepts and methods of calculus of probability and how to apply basic methods of calculus of probability to solve theoretical and practical problems in various fields of science and technology

PEU_W02 have knowledge of the tasks of statistical hypothesis testing and basic tests on parameters of distributions and selected non-parametric tests

relating to skills: Student..

PEU_U01 is able to apply basic methods of calculus of probability to solve theoretical and practical problems in engineering applications,

PEU_U02 can select and apply basic statistical tests and can apply and select estimation methods for simple statistical models in engineering applications

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relating to social competences:

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PROGRAMME CONTENT

Lecture		Number of hours
Lec 1,2	The space of elementary events. Events, operations on events. Axiomatic definition of probability. Properties of probability. The classical and geometric probability. Variations, permutations, combinations..	4
Lec 3	The definition of conditional probability. The formula for the total probability. Bayes' formula. Independence of events ..	2
Lec 4	Definition of random variable. Examples. Distribution of random variable. Cumulative distribution and its properties. Classification of random variables. Distributions of functions of random variables ...	2
Lec 5,6	Discrete random variables. Overview of discrete distributions: two-point, binomial, Poisson. Poisson approximation to the binomial distribution. Continuous random variables. Probability density function and its relationship with the cumulative distribution function. Overview of continuous distributions: uniform, normal, exponential.	4
Lec 7	The parameters of random variables. The expected value and its properties. Moments of higher orders. The variance and its properties. Quantiles. Expected values, variances, medians and quantiles of selected distributions. Standardization of a random variable with a normal distribution. Normal distribution tables.	2
Lec 8	Two-dimensional random variables. The definition of the bivariate cumulative distribution and density. Marginal distributions. Independence of random variables. Moments, the correlation coefficient. Sequences of random variables: sum of independent random variables, expected value and variance	2

	of such a sum. The weak law of large numbers.	
Lec 9	The definition of convergence in distribution. Central limit theorem, Moivre`a – Laplace’s theorem, Lindeberg-Levy’s theorem,.	2
Lec 10	Basic concepts of statistics, the concept of statistical test, tests of significance, errors of the 1st and 2nd kind (false positive and false negative), examples of simple hypothesis tests	2
Lec 11	Tests for the mean, test for the correlation coefficient, selected non-parametric tests – chi-squared tests, examples of <i>selection</i> tests and their applications	2
Lec 12	Elements of the theory of parametric estimation - requirements for estimator ((asymptotic) unbiasedness, consistency, variance of an estimator and Cramer-Rao inequality)	2
Lec 13	Classical methods of constructing estimators (methods of: moments and maximum likelihood) with application examples	2
Lec 14	Introduction to the estimation of linear regression	2
Lec 15	Summary	2
	Total hours	30
Classes		Number of hours
Cl 1,2	The space of elementary events. Events, operations on events. Axiomatic definition of probability. Properties of probability. The classical and geometric probability. Variations, permutations, combinations..	4
Cl 3	The definition of conditional probability. The formula for the total probability. Bayes' formula. Independence of events ..	2
Cl 4	Definition of random variable. Examples. Distribution of random variable. Cumulative distribution and its properties. Classification of random variables. Distributions of functions of random variables ...	2
Cl 5,6	Discrete random variables. Overview of discrete distributions: two-point, binomial, Poisson. Poisson approximation to the binomial distribution. Random variables of the continuous type. Density of probability Density and its relationship with the cumulative distribution function. Overview of continuous distributions: uniform, normal, exponential.	4
Cl 7	The parameters of random variables. The expected value and its properties. Moments of higher orders. The variance and its properties. Quantile of order p. Expected values, variances, medians and quantiles of selected distributions. Standardization of a random variable with a normal distribution. Normal distribution tables.	2
Cl 8	Two-dimensional random variables. The definition of the cumulative distribution and density. Marginal distributions. Independence of random variables. Moments, the correlation coefficient. Sequences of random	2

	variables: the summation of independent random variables, expected value and variance of such a sum. The law of large numbers (weak).	
Cl 9	The definition of convergence in distribution. Central limit theorem, Lindeberg-Levy's theorem, Moivre's – Laplace's theorem.	2
Cl 10	Basic concepts of statistics, the concept statistical test, tests of significance, errors of 1st and 2nd kind (false positive and false negative), examples of simple hypothesis tests	2
Cl 11	Tests for the expected value, test for correlation coefficient, selected non-parametric tests – chi-squared tests, examples of selection tests and their applications	2
Cl 12	Elements of the theory of parameter estimation - requirements for estimator ((asymptotic) unbiasedness, consistency, variance of an estimator and Cramer-Rao inequality)	2
Cl 13	Classical methods of constructing estimators (methods of: moments and maximum likelihood) with application examples	2
Cl 14	Introduction to the estimation of linear regression	2
Cl 15	Summary	2
	Total hours	30

TEACHING TOOLS USED

N1. Chalkboard
N2. Consultations
N3. Self-education
N4. Computer with program for statistics (STATISTICA, MATLAB or, at least EXEL)

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 – PEU_W02	Test
F2	PEU_U01 – PEU_U02	Test
P = P = (0.51*F1+0.49*F2); F1 and F2 must be positive		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] [Douglas C. Montgomery, Applied Statistics and Probability for Engineers Third Edition

SECONDARY LITERATURE:

- [2] J. Jakubowski, R. Sztencel, Rachunek prawdopodobieństwa dla prawie każdego, Script, Warszawa 2002.
- [3] A. Papoulis, Prawdopodobieństwo, zmienne losowe i procesy stochastyczne, WNT, Warszawa 1972.
- [4] H. Jasiulewicz, W. Kordecki, Rachunek prawdopodobieństwa i statystyka matematyczna. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2001.
- [5] A. Plucińska, E. Pluciński, Probabilistyka, WNT, Warszawa 2006.
- [6] W. Krywicki, J. Bartos, W. Dyczka, K. Królikowska, M. Wasilewski, Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, Cz. I-II, PWN, Warszawa 2007.
- [7] PRD. Bobrowski, Probabilistyka w zastosowaniach technicznych, PWN, Warszawa 1986.
- [8] A. A. Borowkow, Rachunek prawdopodobieństwa, PWN, Warszawa 1975.
- [9] W. Feller, Wstęp do rachunku prawdopodobieństwa, T. I, PWN, Warszawa 2006.
- [10] M. Fisz, Rachunek prawdopodobieństwa i statystyka matematyczna, PWN, Warszawa 1967.
- [11] T. Inglot, T. Ledwina, Z. Ławniczak, Materiały do ćwiczeń z rachunku prawdopodobieństwa i statystyki matematycznej, Wydawnictwo Politechniki Wrocławskiej, Wrocław 1984.
- [12] J. Jakubowski, R. Sztencel, Wstęp do teorii prawdopodobieństwa, Script, Warszawa 2001.
- [13] W. Kordecki, Rachunek prawdopodobieństwa i statystyka matematyczna. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2002.
- [14] Koronacki J., Mielniczuk J., Statystyka dla kierunków technicznych i przyrodniczych. WNT, Warszawa, 2001.
- [15] Gajek, Kałuszka, "Wnioskowanie statystyczne", WNT, Warszawa, 2000
- [16] Wybrane rozdziały z podręczników prof. Magiery i prof. Krzysko (beda wskazane na wykładzie)
- [17] Kordecki W., Rachunek prawdopodobieństwa Oficyna Wydawnicza PWr, Wrocław 2003.
- [18] Krywicki W. i inni, Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, Czesc I i II, PWN, Warszawa, 1996.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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