Załącznik nr 9
do Zarządzenia Rektora PŚk Nr 35/19
w brzmieniu ustalonym Zarządzeniem Nr 12/22

COURSE DESCRIPTION

Course code	full-time studies	
	part-time-studies	
Course name	**Matematyka 3**	
Course name in English	**Mathematics 3**	
Valid from academic year	**2022/23**	

PLACEMENT IN THE TEACHING PROGRAM

Field of study	**Computer Science**
Level of education	**1st degree**
Studies profile	**General**
Form and method of teaching classes	**Full-time and part-time studies**
Specialization	**All specializations**
Organizational unit responsible for the course	**Department of Applied Informatics**
Course coordinator	**Katarzyna Poczęta, PhD**
Approved by	**Dean of the Faculty of Electrical Engineering, Automatic Control and Computer Science Roman Deniziak, KUT prof., DSc, PhD**

GENERAL CHARACTERISTIC OF THE COURSE

Course affiliation		**Major**
Course status		**Mandatory**
Language		**English**
Semester	full-time studies	**3rd semester**
	part-time-studies	**3rd semester**
Requirements		**Mathematics 1,2**
Exam (YES/NO)		**Yes**
ECTS		**5**

Course form		**lecture**	**classes**	**laboratory**	**project**	**other**
Hours per semester	full-time studies	**30**	**30**			
	part-time-studies	**18**	**18**			

LEARNING RESULTS

Category	Result Symbol	Learning Results	References to the field of study results
Knowledge	W01	Students know and understand selected probabilistic methods and the basics of mathematical statistics	INF_W3
Skills	U01	Students are able to calculate the probability of events and basic statistical characteristics	INF_U3
Social competence	K01	Students are ready to recognize the importance of the learned methods in solving engineering problems	INF_K1, INF_K2

COURSE CONTENT

Course Form	Content
lecture	1. Fundamentals of probability theory. Probabilistic models. Sample space. Events. Combinatorics. Classical definition of probability. Geometric probability. 2. Independence. Conditional probability. Independence of two events. Independence of collection of events. Conditional probability. 3. Bayes' theorem. Bernoulli trials. Total probability. Bayes' theorem. Naive Bayes classifier. Bernoulli trials. 4. Introduction to random variables. Random variable definition. Types of random variables. Probability density function. Discrete random variables. Continuous random variables. Cumulative distribution function. Moments of discrete random variables. Popular distributions. Bivariate random variables. Covariance of bivariate random variables. Correlation coefficient. Linear regression. 5. Weak laws of large numbers. Central limit theorems. Markov's inequality. Chebyshev's inequality. De Moivre-Laplace theorem. Lindeberg-Levy theorem. 6. Point estimation. Interval estimation. Methods for point estimation. Criteria to evaluate the goodness of an estimator. Confidence Interval for Population Mean. Confidence Interval for Population Variance. Confidence Interval for Population Standard Deviation 7. Test of Statistical Hypotheses. Hypothesis tests. Critical region. Methods of evaluating tests. Hypothesis testing algorithm. 8. Random numbers generators. Computer simulations. Linear congruential generator. Examples of implementations. Samples of discrete distributions. Samples of continuous distributions.
classes	1. Fundamentals of probability theory. Probabilistic models. Sample space. Events. Combinatorics. Classical definition of probability. Geometric probability. 2. Independence. Conditional probability. Independence of two events. Independence of collection of events. Conditional probability. 3. Bayes' theorem. Bernoulli trials. Total probability. Bayes' theorem. Bernoulli trials. 4. Introduction to random variables. Random variable definition. Types of random variables. Probability density function. Discrete random variables. Continuous random variables. Cumulative distribution function. Moments of discrete random variables. Popular distributions. Bivariate random variables. Covariance of bivariate random variables. Correlation coefficient. Linear regression. 5. Weak laws of large numbers. Central limit theorems. Markov's inequality. Chebyshev's inequality. De Moivre-Laplace theorem. Lindeberg-

	Levy theorem. 6. Point estimation. Interval estimation. Methods for point estimation. Criteria to evaluate the goodness of an estimator. Confidence Interval for Population Mean. Confidence Interval for Population Variance. Confidence Interval for Population Standard Deviation 7. Test of Statistical Hypotheses. Hypothesis tests. Critical region. Methods of evaluating tests. Hypothesis testing algorithm.

LEARNING RESULTS VERIFICATION METHODS

Result Symbol	Learning results verification methods					
	Oral Exam	Written Exam	Midterm	Project	Report	Other
W01		X	X			
U01		X	X			
K01		X	X			

ASSESSMENT FORMS AND CRITERIA

Course Form	Assessment Form	Assessment Criteria
lecture	Passing grade	The student should obtain at least 50% points from written exam.
classes	Passing grade	The student should obtain at least 50% points from midterm tests.

STUDENT'S VOLUME OF WORK

ECTS Balance												
No.	Activity Type	Student Involvement										Unit
		full-time studies					part-time-studies					
1.	Participation in classes according to the schedule	Lec	C	Lab	P	S	Lec	C	Lab	P	S	h
		30	30				18	18				
2.	Other (consultations, exams)	2	2				2	2				h
3.	**Total with the direct assist of an academic teacher**	**64**					**40**					h
4.	**Number of ECTS, that students obtains with the direct assist of an academic teacher**	**2,56**					**1,6**					ECTS
5.	**Hours of unassisted student work**	**61**					**85**					h
6.	**Number of ECTS that student obtains working unassisted**	**2,44**					**3,4**					ECTS
7.	**Practical classes volume of work**	**30**					**18**					h
8.	**Number of ECTS obtained by student at practical classes**	**1,20**					**0,72**					ECTS
9.	**Total student's volume of work expressed in hours**	**125**					**125**					h
10.	**ECTS**	**5**										ECTS

BIBLIOGRAPHY

1. Ash R.B. BASIC PROBABILITY THEORY, DOVER PUBLICATIONS, INC. Mineola, New York, 2008.
2. Hausner M.: General Theory of Finite Probability Spaces. In: Elementary Probability Theory. Springer, Boston, MA, 1995.
3. Jastriebow A., Łaskawski M., Tuszyński L.: Wprowadzenie do metod probabilistycznych (Introduction to Probabilistic Methods). Wydawnictwo Politechniki Świętokrzyskiej, Kielce 2009.
4. Prasanna Sahoo: PROBABILITY AND MATHEMATICAL STATISTICS. Department of Mathematics University of Louisville Louisville, KY 40292 USA, 2013.