SYLLABUS OF A MODULE

Polish name of a module	**Analiza Systemów Probabilistycznych (i Statystyka)**
English name of a module	**Probabilistic Systems Analysis (& Statistics)**
ISCED classification - Code	0613
ISCED classification - Field of study	*Software and applications development and analysis*
Languages of instruction	*English*
Level of qualification: ***1 – BSc (EQF 6)*** ***2 – MSc (EQF 7)*** ***3 – PhD (EQF 8)***	*2*
Number of ECTS credit points	*5*
Examination: ***EO – exam oral*** ***EW – exam written*** ***A - assignment***	*EW*
Available in semester: ***S – Spring only*** ***A – autumn only*** ***Y - both***	*S*

Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
30	15	30			

MODULE DESCRIPTION

Module objectives

O1. Making the students familiar with the elements of the theory and methods of probability useful in engineering problems.

O2. Making the students familiar with the elements of the statistical methods.

O3. Introducing the students into using the computer methods in probability and statistics.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Course of the calculus of one variable.

LEARNING OUTCOMES

LO 1 – student is familiar with the basics of probability; student understands the need of probability in statistics.

LO 2 – student is familiar with the introductory methods of a point and interval estimation; student is able to use Maple in solving simple estimation.

LO 3 – student is familiar with the introductory methods of a hypothesis testing; student is able to use Maple in solving problems of this type.

MODULE CONTENT

Type of classes – Lecture	**Number of hours**
Lec 1 - Course introduction. The subject of statistics, the need of probability. Types of data.	**2**
Lec 2 - Methods for describing data.	**2**
Lec 3 - The numerical descriptive measures.	**2**
Lec 4 - The numerical descriptive measures, cont. , random experiment, events, sample spaces.	**2**
Lec 5 - Probability – axioms and properties.	**2**
Lec 6 - Conditional probability, total probability, Bayes' theorem.	**2**
Lec 7 - Independence. Introduction to the random variables. Discrete random variables.	**2**
Lec 8 – Probability distribution for discrete random variable, expected value. Basic discrete distributions.	**2**
Lec 9 - Continuous random variables. Probability distribution for continuous random variables, expected value. Basic continuous distributions.	**2**
Lec 10- Basic continuous distributions cont. Introduction to sampling distributions.	**2**
Lec 11- Introduction to sampling distributions cont. The laws of large numbers. The central limit theorem.	**2**
Lec 12 - The point estimation.	**2**
Lec 13 - The confidence intervals.	**2**
Lec14 – Test of hypothesis: single sample.	**2**
Lec 15 – Test of hypothesis: two samples.	**2**
Sum	**30**
Type of classes– Tutorials	**Number of hours**
Tut 1 - Types of data.	**1**
Tut 2 - Graphical description of data.	**1**
Tut 3 - The mode, the arithmetic mean.	**1**
Tut 4 - The range of data. Variance and standard deviation.	**1**
Tut 5 - Variance and standard deviation cont., Interpretation of the standard deviation.	**1**
Tut 6 - Properties of probability, Bayes' rule.	**1**
Tut 7 – Independence.	**1**
Tut 8 - Discrete random variables: calculating the expected value and the standard deviation.	**1**
Tut 9 - Discrete random variables: applications to the real world problems.	**1**
Tut 10- Continuous random variables: calculating the expected value and the standard deviation.	**1**
Tut 11- Continuous random variables: applications to the real world problems.	**1**
Tut 12 - Point estimation, maximum likelihood method.	**1**
Tut 13 - A confidence interval for a population mean a large sample case.	**1**
Tut 14 - Test of hypothesis about a population mean a large sample case.	**1**

Tut 15 – The power of a test, p-value of a test.	**1**
Sum	**15**
Type of classes - Laboratory	**Number of hours**
Lab 1 - Review of integration.	**2**
Lab 2 - Methods for describing data.	**2**
Lab 3 - Calculating numerical descriptive measures.	**2**
Lab 4 – Basic combinatorics.	**2**
Lab 5 – Classical definition of probability.	**2**
Lab 6 – Conditional probability, total probability, Bayes' theorem, independence.	**2**
Lab 7- Discrete random variables.	**2**
Lab 8 – Probability distribution for discrete random variable, expected value.	**2**
Lab 9 – Continuous random variables. Probability distribution for continuous random variables, expected value.	**2**
Lab 10 – Generating pseudorandom numbers.	**2**
Lab 11 – Various problems concerning discrete and continuous random variables.	**2**
Lab 12 – The point estimation.	**2**
Lab 13 – The confidence intervals.	**2**
Lab 14-15 – Test of hypothesis: single sample.	**4**
Sum	**30**

TEACHING TOOLS

1. Lecture
2. Tutorials
3. Computer laboratory

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. Assessment of preparation for laboratory exercises
F2. Assessment of activity during classes
S1. Assessment of the ability to solve the posed problems and the method of presentation of the obtained results – Test/Oral examination
S2. Assessment of mastery of the lecture material – passing the lecture (exam)

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	**Forms of activity**	**Average number of hours required for realization of activity**
1. Contact hours with teacher		
1.1	Lectures	30
1.2	Tutorials	15
1.3	Laboratory	30
1.4	Seminar	0
1.5	Project	0
1.6	Examination	2

	Total number of contact hours with teacher:	77
2.	**Student's individual work**	
2.1	Preparation for tutorials and tests	13
2.2	Preparation for laboratory exercises, writing reports on laboratories	15
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	0
2.5	Preparation for examination	9
2.6	Individual study of literature	11
	Total number of hours of student's individual work:	48
	Overall student's workload:	125
Overall number of ECTS credits for the module		5
Number of ECTS points that student receives in classes requiring teacher's supervision:		3.08
Number of **ECTS** credits acquired during practical classes including laboratory exercises and projects:		1.8

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Lecture notes
2. Ramachandran, K. M., Tsokos.C.P., *Mathematical statistics with applications*, Elsevier Academic Press, 2009
3. J.T.McLeve, P.G.Benson, *Statistics for business and economics*, Macmillan, London 1988 and later issues

MODULE COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

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