COURSE DESCRIPTION

1. Program Information

1.1 University	**“Alexandru Ioan Cuza” University, Iaşi**
1.2 Faculty	**Computer Science Department**
1.3 Department	**Computer Science**
1.4 Study Domain	**Computer Science**
1.5 Study Cycle	**Undergraduate**
1.6 Study Program / Qualification	**Computer Science**

2. Course Information

2.1 Course Name							
2.2 Course Teacher			**Lect. Dr. Olariu Emanuel Florentin/Conf. Dr. Zalinescu Adrian**				
2.3 Seminary Teacher			**Lect. Dr. Olariu Emanuel Florentin/Conf. Dr. Zalinescu Adrian**				
2.4 Study Year		**2.5** Semester		**2.6** Evaluation		**2.7** Course Status*	**OB**

** OB – Compulsory / OP – Optional*

3. Total estimated hours (hours per semester and didactic activities)

3.1 Hours per week	**4**	in which: **3.2** course	**2**	**3.3** seminary/laboratory	**2**
3.4 Hours in curriculum	**56**	in which: **3.5** course	**28**	**3.6** seminary/laboratory	**28**

Time Distribution	hours
Manual study, Course support, Bibliography, and others	**14**
Supplementary Documentation in library, in electronic forums, and on the field	**7**
Seminaries/laboratories preparation, homeworks, reports, portfolios and essays	**35**
Tutoring	**-**
Evaluation	**4**
Other activities (consultations per student)	**-**

3.7 Total hours individual study	**56**
3.8 Total hours per semester	**116**
3.9 Credits	**4**

4. Preconditions (if necessary)

4.1 Of Curriculum	Mathematics
4.2 Of Skills	Manipulate abstract mathematical concepts

5. Conditions (if necessary)

5.1 For Course Operation	**-**
5.2 For Seminary/Laboratory Operation	Laboratories are mandatory.

6. Specific Skills Acquired

SkillsProfessional	**C1.** The understanding and the use of specific concepts related to discrete probability theory and inferential statistics. **C2.** The correct interpretation of basic concepts like random experiment, random event, probability function, and random sample, sample mean, frequencies, histograms. **C3.** The use of elementary notions for understanding the more complex concepts (random variable, joint repartition, stochastic processes, inequalities involving random variables, random algorithms, central limit theorem (CLT), law of large numbers (LLN), confidence interval, significance tests etc). **C4.** The capacity of manipulating concepts from both, probability theory and applied statistics. **C5.** The understanding of usual applications of probability ans statistics.
SkillsTransversal	**CT1.** The development of efficient individual study skills and of personal responsibility towards the teaching institution (university). **CT2.** The capacity of understanding the utility of the interdisciplinary connections. **CT3.** The creative crossover between theory and practice.

7. Course Objectives (from the grid of specific skills acquired)

Objectives7.1 General	The taming of elementary and medium-avenced concepts from probability theory and descriptive/inferential statistics.
7.2 Specific Objectives	At the end of this course, the students will be able to: ▪ Explain basic notions like: random event, probability function, random variable, random sample expectation, variance etc. ▪ Describe more complex notions like: stochastic process, random algorithms, CLT, LLN, statistical inference etc. ▪ Use and inter-connect the above concepts. ▪ Analyze and discriminate between the different types of repartitions for significance tests. ▪ Calculate (using probabilistic formulas/schemes) various probabilities and discrete random variable characteristics, and use R for various statistical inferences.

8. General Description

8.1	**Course**	**Teaching Methods**	**Observations** (hours and bibliographic references)
1.	Random experiment, random event, probability function.	Exposition	2, [1], [4], [8]
2.	Conditional probability, independence. Probabilistic formulas.	Exposition	2, [1], [4], [8]
3.	Probabilistic schemas. Random variable.	Exposition	2, [1], [4], [8]
4.	Random variables characteristics. Noteworthy discrete repartitions. Joint discrete distributions.	Exposition	2, [1], [4], [8]

5.	Covariance, independent variables. Markov and Chebyshev inequalities.	Exposition	2, [1], [4], [8]
6.	Stochastic processes. Markov chains. Random walks	Exposition	2, [1]
7.	Random algorithms. Probabilistic method.	Exposition	2, [1], [3], [6], [10]
8.	Summing up of concepts like random event, probability, random variable, inequalities, stochastic process.	Written test	
9.	Descriptive statistics. Central tendency, variability, histograms.	Exposition	2 ,[2],[6]
10.	Continuous random variables. The fundamental laws. Computer simulation.	Exposition	2, [1],[5]
11.	Computer simulation. Monte Carlo methods.	Exposition	2, [1],[5]
12.	Confidence intervals. Significance tests. Inference on proportions.	Exposition	2, [2],[9]
13.	Significance tests. Inference on one and two populations.	Exposition	2, [2],[9]
14.	Linear correlation and regression.	Exposition	2, [2],[9]

Bibliography

Main references:

[1] Bertsekas, D. P., J. N. Tsitsiklis, Introduction to Probability, Athena Scientific, 2002.
[2] Freedman D.,Pisani R. , Purves R.,Statistics, W.W.Norton&Company, 4th edition, 2007.
[3] Motwani, R., P. Raghavan: Randomized Algorithms, Cambridge University Press, 2005.
[4] Ross, S. M., A First Course in Probability , Prentice Hall, 5th edition, 1998.
[5] Baron, M.: Probability and Statistics for Computer Science, Chapman&Hall/CRC Press, 2013.

Supplementary references:

[6] Alon, N., J. H. Spencer, The probabilistic method, Wiley, 2008
[7] P. Dalgaard, Introductory Statistics with R, Springer Verlag, 2nd edition, 2008.
[8] Gordon, H., Discrete Probability, Springer Verlag, New York, 1997.
[9]Johnson, R. : Elementary Statistics, PWS Publishers - Duxbury Press, Boston, 1991
[10] Mitzenmacher, M., E. Upfal: Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University Press, 1995.

8.2	**Seminary / Laboratory**	**Teaching methods**	**Observations** (hours and bibliographic references)
1.	Random experiment, random events, probability function (axioms, properties).	Course memento, exercice examples and exercices solving.	2, [4], [8]
2.	Conditional probability. Independence. Probabilistic formulas.	idem	2, [4], [8]
3.	Probabilistic schemas (hypergeometric, binomial, geometric). Random variables.	idem	2, [4], [8]
4.	Random variables parameters (expectation, variance) Discrete repartitions (uniform, Bernoulli, binomial, geomrteic, Poisson).	idem	2, [1], [4], [8]

5.	Joint repartitions – covariance, correlation. Markov and Chebyshev inequalities.	idem	2, [1], [4], [8]
6.	Markov chains, Chapman-Kolmogorov equation, steady state theorem.	idem	2, [1]
7.	R introduction.	idem	2, [7]
8.	Partial evaluation.	Partial exam discussions.	2
9.	Descriptive statistics	Course memento, laboratory woks examples and individual works.	2, [2], [7]
10.	Randomized algorithms.	idem	2, [3], [7]
11.	Computer simulation. Monte Carlo methods	idem	2, [5], [7]
12.	Inferential statistics. Confidence intervals. Proportion test.	idem	2, [2], [7]
13.	Inferential statistics. Z test, t test.	idem	2, [2], [7]
14.	Laboratory evaluation	idem	2

9. Course content synchronization with the expectations of the community representatives, professional associations and employers from the program domain

This course aims to accommodate the undergraduate students with the modern framework of discrete probability and applied statistics. The course acquisitions will be used throughout the undergraduate studies and beyond.

10. Evaluation

Activity Type	**10.1 Evaluation criteria**	**10.2 Evaluation methods**	**10.3 The weight of each evaluation form (%)**
10.4 Course			
10.5 Seminary/ Laboratory	Attendance on laboratory, lab activity, and homeworks (50% - minimum 5 grade), seminar tests (50% - minimum 5 grade)	Written tests from seminar and works from laboratory	100.00%
10.6 Minimal performance standards			
Promotion starts from 5, and the final hierarchy will be established using ETCS rules.			

Date

Course Teacher
Lect. Dr. Olariu Emanuel Florentin/Conf. Dr. Zalinescu Adrian

Seminary/Laboratory Teacher
Lect. Dr. Olariu Emanuel Florentin/Conf. Dr. Zalinescu Adrian

Department Date of Approval

Director of the Department
Prof. Dorel Lucanu, PhD