Course Unit Descriptor

Study Programme: Information Technologies	
Course Unit Title: Combinatorics, Probability and Statistics	
Course Unit Code: IT451	
Name of Lecturer(s): Mirjana Mikalački	
Type and Level of Studies: Bachelor Academic Studies	
Course Status (compulsory/elective): Compulsory	
Semester (winter/summer): Winter	
Language of instruction: Serbian (primary), English (secondary)	
Mode of course unit delivery (face-to-face/distance learning): Face-to-face	
Number of ECTS Allocated: 6	
Prerequisites: Discrete Structures 1, Discrete Structures 2	

Course Aims:

Teaching students to understand basic ideas and concepts of probability theory, that includes some combinatorics, and statistics, with applications in computer science.

Learning Outcomes:

Minimal: At the end of the course, it is expected that students know basic concepts of combinatorics and standard types of random variables and distributions that are most commonly used in computer science and that they can calculate expectation and variance, and master some standard statistical methods.

Desirable: At the end of the course, it is expected that successful students can combine basic and advanced knowledge in probability theory and statistics in solving more complex problems.

Syllabus:

Basics of combinatorics, counting, binomial and multinomial coefficients. Principle of inclusion and exclusion. Events, outcomes, probability spaces and their properties. Conditional probability. Bayes' formula, independent events. Random variables. Discrete and continuous distributions. Expectation, properties. Variance, properties. Limit theorems. Simulations. Probability and algorithms. Statistical analysis. Population, sample. Methods of parameter estimation. Hypothesis testing.

Required Reading:

- D. Mašulović, *Odabrane teme diskretne matematike*, Departman za matematiku i informatiku, PMF u Novom Sadu, 2007.
- S. Ross, *A First Course in Probability*, Ninth Edition, Pearson, 2014.
- J. Rice, *Mathematical Statistics and Data Analysis*, Third Edition, Duxbury, 2006.
- M. Mitzenmacher, E. Upfal, *Probability and computing: Randomized algorithms and probabilistic analysis*, Cambridge University Press, 2005.
- R. Tošić, *Kombinatorika*, Univerzitetski udžbenik 88, 1999.
- D. Rajter Ćirić, *Verovatnoća*, drugo dopunjeno izdanje, PMF, Novi Sad, 2009.
- Z. Lozanov Crvenković, *Statistika*, PMF, Novi Sad, 2012.

Weekly Contact Hours: 5	**Lectures:** 3	**Practical work:** 2

Teaching Methods:

Frontal lectures, using classical methods. Blackboard exercises.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points

| Colloquia | 50 | oral exam | 50 |

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.