

Study program: Information Technology, Technics and Informatics			
Type and level of studies: Undergraduate studies IT, Integrated academic studies TI			
Course title: Discrete Mathematics			
Name of lecturer/lecturers: Damljanović Ž. Nada			
Language of instruction: English			
ETCS: 6			
Prerequisites: -			
Semester: Summer			
Course unit objective			
Enabling students to develop abstract and algorithmic thinking using mathematical reasoning and logic, and to acquire fundamental knowledge of combinatorial analysis, discrete structures, graphs, languages, automata, computation, modelling and applications.			
Learning outcomes of Course unit			
At the end of the course, students would master basic ideas, concepts and results of discrete mathematics, and they would be able to apply practically their knowledge within the same or within some other scientific fields and subjects.			
Course unit contents			
<i>Theoretical classes</i>			
Propositional logic: propositional variables, logical constants, logical operations, logical expressions, logical equivalence, tautologies and contradictions, logical argumentation, errors in reasoning. Predicate logic: predicates, quantifiers, logical argument with quantifiers. Techniques of proving: methods of proving, direct and indirect proofs, mistakes in proving, strategy of proving, forward and backward reasoning, mathematical induction, recursive definitions, structural induction. Sets: equality and inclusion, set operations, ordered n-tuples, Cartesian product. Relations: equivalences, partition of sets, ordered sets. Functions: correspondences and functions, bijections, inverse functions, operations, sequences and matrices. Cardinals and counting: set cardinality, finite and infinite sets, countable and uncountable sets, counting principles, permutations, inclusion-exclusion principle. Algebraic structures: groupoids, semigroups, groups, semirings, rings, fields, congruence and factor sets, Boolean algebra, minimization of Boolean functions, binary decision diagrams. Formal languages: operations and combinatorics on words, formal languages, generative grammars, classification of grammars. Automata: Deterministic and nondeterministic automata, minimal language of automata, regular expressions and their applications, automata with outputs, Automata of Mealy and Moore type, equivalent automata, minimization of automata with output. Turing machines: their languages, questions of decidability, computability and complexity. Graphs: planarity, Euler walk, Hamiltonian cycle, and the travelling salesman problem, pairing the bipartite graphs, chromatic number of a graph, trees, direct graphs, labelled graphs.			
<i>Practical classes</i>			
Solving concrete problems, examples and exercises based on exposed theoretical concepts and principles.			
Literature			
[1] K. H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill Education, 6 edition, 2006.			
[2] H. Lewis, R. Zax, Essential Discrete Mathematics for Computer Science, Princeton University Press, 2019.			
[3] M. Ćirić, J. Ignjatović, Theory of Algorithms, Languages and Automata, PMF u Nišu, 2012 (in Serbian).			
[4] Cvetković, S. Simić, Discrete Mathematics, Prosveta, Niš, 1996 (in Serbian).			
Number of active teaching hours			
Lectures: 2	Practice: 3	Other forms of classes:	Independent work:
			Other classes
Teaching methods			
The lectures are performed using classical methods of teaching in combination with video projector and active interaction with students. Knowledge of students is tested by homework, colloquium, and final exam (written and oral). At the final, a comprehensive understanding of the exposed material is checked.			
Examination methods (maximum 100 points)			
Exam prerequisites:	No. of points:	Final exam:	No. of points:
Student's activity during lectures	6	oral examination	25
Practical classes/tests	30	written examination	35
Seminars/homework	4	
Project			
Other			
Grading system			

Grade	No. of points	Description
10	91-100	Excellent
9	81-90	Exceptionally good
8	71-80	Very good
7	61-70	Good
6	51-60	Passing
5	Less than 50	Failing