SYLLABUS
of the subject «Mathematical foundations of computer science»

Prerequisites	no			
The competences acquired (knowledge and the skills received after studying of the given subject).	**The student should operate with the following mathematical concepts: the set and operations over them, notation and computer representation of numbers, logic connectives and logic laws, binary relations and operations, algebraic structures on sets, structure of graphs, language and grammar definition, logic bases of the computer and finite automata, and handle methods of representation of numbers and coding of information, be able to use the above-listed mathematical concepts, methods of recursion and iteration in elaboration of algorithms to solve problems.**			
Themes of lectures	**Lec.**	**Prac./Lab. work**		**Ref.**
		Content	**Hours**	
1-Sets				
Concept of set and their properties, subset. Finite and infinite sets. Euler-Wenn diagram. Set-theoretical operations. Union. Intersection. Subtraction. Equivalence. Number sets. Sets of natural, integer, real numbers. Set of interval numbers.	2 h.	Examples of representation of sets. Number sets and their representation. Examples of representation of set-theoretical operations in the form of Euler-Wenn diagram. Representation of equivalent sets.	2 h.	[1], [4]
2-Notations. Information coding				
Notations. Transfer of numbers from one notation in another. Arithmetic operations in positional systems of calculation. Computer representations of numbers: numbers in the fixed point and floating point formats. Information coding. The international systems of the coding.	2 h.	Examples of positional and non-positional notations. Notations with the base 2^n, n=1, 3, 4. Binary and hexagonal arithmetic. Transfer of numbers. Computer representations of numbers.	2 h.	[2], [8]
3-Bases of mathematical logic				
Statements and logic connectives. The logic form of the statement: the subject, a predicate, connectives, premises. Conclusions: deductive, inductive. Concepts of the proof. Logic connectives: disjunction, conjunction, negation, implication, equivalence. Truth tables. Logic functions. Concepts of a tautology and the contradiction.	2 h.	Examples of statements, definition of concept of the subject, predicate, connective and premise. Examples of construction of logic connective and truth tables. Examples of logic functions.	2 h.	[1], [2], [8], [5]

4-Logic laws				
Duality principle. Logic laws: the law of double negation. The commutative law. The distributive law. The law of an exception of constants. The contradiction law. The law of excluded middle. Rule of Modus ponens. Rules of a logic conclusion. Logic consequences. Parcels of a logic consequence. Conclusion. Predicates. Generality and existential quantifiers. Logic bases of the computer.	2 h.	Examples of application of laws of logic. Examples of a logic conclusion. Schemes of logic representation of conjunctor, disjunctor and inverter.	2 h.	[1], [2], [8], [5]
5-Binary relations. Algebraic structures on sets				
Concept of the relation and the order relation. Properties of relations: reflexivity, symmetry, transitivity, antisymmetry. The equivalence relation. Relations of a partial order. Binary relations. Functions. Binary operations. Concepts of a regular element and a neutral element. Properties of binary operations: associativity, commutativity, distributivity. Symmetric elements. Algebraic structure on set. Isomorphism. Semigroups. Group.	2 h.	Examples of relations and their properties. Examples of binary relations. Examples of functions, compositions of functions, inverse function. Examples of binary operations. Examples of representation of algebraic structures on sets.	2 h.	[2]
6-Graphs				
Concept of the graph. Vertices, edges of the graph. An adjacency matrix of the graph. Subgraphs. Degree of vertex of the graph. A route in the graph. Chains. Kinds of graphs. Ways and contours in the graph. A tree.	2 h.	Examples of construction of the graph. Construction of a adjacency matrix. Examples of structure of a tree.	2 h.	[5], [6], [3], [9], [7]
7-Languages and grammar (syntax)				
The basic concepts of language and grammar. Grammar with phrase structure. Text processing rules.	2 h.	As an example of context free grammar.	2 h.	[3]
8-Finite automata				
Concept of the universal automaton. Finite automata.	1h.	As an example of a finite automaton.	1 h.	[3], [8]
TOTAL:	**15 h.**		**15 h.**	

References

1. Turetsky V.J. Mathematics and computer science.- Moscow: Infra-M, 2000.
2. Urginovich N. The Practical work on information technologies.- Moscow: BINOM, 2004.
3. Kuk D. The computer mathematics. - Moscow: Nauka, 1990.
4. Kozlov V.N.. Mathematics and computer science.- Piter, 2004.
5. Chechkin A.V.. Mathematical computer science.- Moscow: the Science, 1991.
6. Akimov O.E.. The discrete mathematics: logic, groups, graphs.- Moscow: The Laboratory of base knowledge, 2001.
7. Novikov F.A. The discrete mathematics for programmers: the Textbook for high schools. –St-Petersburg: Piter, 2008.
8. Meyer B., Baudoin C. Programming methods. In two parts: Part 2. Translate from French Y.A. Pervina - Moscow: Mir,1982.
9. Borubaev A.A., Pankov P.S. Discrete mathematics. Kyrgyz-Russain Slavic University, Bishkek, 2010.