Subject code	ECTS credits
MAT2004	6

Course title in Lithuanian

DISKREČIOJI MATEMATIKA

Course title in English

DISCRETE MATHEMATICS

Short course annotation in Lithuanian (up to 500 characters)

Kurse dėstomi diskrečiosios matematikos pagrindai: aibių teorija, matematinės indukcijos principas, kombinatorika, binominių koeficientų tapatybės, rėčio principas, siurjekcijų skaičius, Stirlingo, Belo ir Fibonačio skaičiai, skirtuminis operatorius, laipsninė ir eksponentinė generuojančios funkcijos, rekurenčiųjų sąryšiu teorija, sudėtinių funkcijų Tayloro koeficientai, grandininės trumpenos, pagrindinės grafų teorijos ir matematinės logikos sąvokos.

Short course annotation in English (up to 500 characters)

This course includes fundamentals of discrete mathematics: countable sets, principle of mathematical induction, combinatorial analysis, binomial coefficients identities, principle of sieve, number of surjections, Stirling, Bell and Fibonacci numbers, difference operator, degree and exponential generating functions, theory of recurrence relations, Taylor coefficients of composite functions, continued fractions, basic concept of graph theory and mathematical logic.

Prerequisites for entering the course

High school mathematics knowledge.

Course aim

Course aim is to provide understanding of discrete mathematics.

Links between course outcomes, criteria of learning achievement evaluation, study methods and methods of learning achievement assessment

No	Course outcomes	Criteria of learning achievement evaluation	Study methods	Methods of learning achievement assessment
1.	Knowledge and understanding of countable sets	Student demonstrates knowledge and deep understanding of countable sets and operations with these sets, recognizes and applies them solving practical and theoretical tasks.	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
2.	Provide knowledge on principle of mathematical induction	Student demonstrates the ability to construct and prove new identities by using principle of mathematical induction.	Lectures, practical works, individual work, consulting	Assessment of practical works
3.	Provide knowledge on combinatorial analysis and binomial coefficients identities	Student demonstrates the ability to identify the problem, analyze theoretical data using number of surjections, Stirling and Bell numbers, principle of sieve. Student also knows the definition of binomial coefficients and can prove the identities of them.	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
4.	Provide knowledge on difference operator	Student is operating with formal mathematical symbols and terms related with operator of	Lectures,	Mid-term exam

		difference, demonstrates the ability to prove well known theorems and lemas of this theory.	individual work, consulting	
5.	Knowledge and understanding of degree and exponential generating functions	Student demonstrates knowledge and deep understanding of concepts and propositions of degree and exponential generating functions. Student recognizes and applies them solving theoretical and practical tasks	Lectures, practical works, individual work, consulting	Final exam, assessment of practical works
6.	Provide knowledge on theory of recurrence relations	Student demonstrates knowledge and deep understanding of theory of recurrence relations. Student demonstrates ability to solve recurrence relations.	Lectures, practical works, individual work, consulting	Final exam, assessment of practical works
7.	Knowledge and understanding of continued fractions	Student demonstrates deep understanding of continued fractions, recognizes and applies them solving theoretical tasks.	Lectures, practical works, individual work, consulting	Assessment of practical works
8.	Knowledge and understanding of graph theory	Student demonstrates the ability to think logically and analytically for solution of practical tasks using graph.	Lectures, practical works, individual work, consulting	Final exam, assessment of practical works
9.	Knowledge and understanding of mathematical logic	Student demonstrates the ability to think logically, to construct, prove and disprove statements, operates with formal mathematical symbols and terms.	Lectures, practical works, individual work, consulting	Final exam, assessment of practical works

Links between study programme outcomes and course outcomes

Study programme outcomes	**Running number of course outcome**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Know and comprehend concepts and propositions of fundamental mathematical subjects, recognize and apply them solving practical/theoretical tasks	+	+	+	+	+	+	+	+	+
Identify the problem, collect and analyze real/theoretical data using various mathematical methods, tools and IT technologies	+		+					+	+
Operating with formal mathematical symbols and terms, determine mathematical connections between various mathematical quantities; conceive mathematical propositions and logical proofs, construct and prove new statements	+	+	+	+	+	+	+	+	+
Think logically and analytically, evaluate alternative ways of task solving and implement optimal solutions	+	+	+		+	+		+	+

Content

No	Content (topics)
1.	Countable sets. Principle of mathematical induction
2.	Combinatorial analysis. Binomial coefficients identities
3.	Principle of sieve.
4.	Number of surjections. Stirling and Bell numbers
5.	Difference operator.
6.	Degree generating function. Exponential generating function
7.	Theory of recurrence relations. Fibonacci numbers
8.	Taylor coefficients of composite functions
9.	Continued fractions
10.	Basic concept of graph theory
11.	Mathematical logic

Distribution of workload for students (contact and independent work hours)

Lectures	**45 hours**
Practical work	**30 hours**
Individual students work	**85 hours**
Total:	**160 hours**

Structure of cumulative score and value of its constituent parts

Final written exam (50%), mid-term written exam (25%), assessment of practical work (25%).

Recommended reference materials

No	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	*Self study rooms*	*Other libraries*
Basic materials						
1	2009	Krylovas A. Diskrečioji matematika. (Discrete Mathematics)	Vilnius, TEV	17	1	
2	2003	Plukas K. Taikomoji diskrečioji matematika. (Applied Discrete Mathematics)	Kaunas, Technologija	4	1	
Supplementary materials						
1	1996	Cameron P.J. Combinatorics: Topics, Techniques, Algorithms	Cambridge University Press			

Course programme designed by

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