COURSE UNIT DESCRIPTION

Course unit title	Course unit code
Discrete Mathematics	

Lecturer(s)	Department where the course unit is delivered
Coordinator: Asist. Prof. Valdas Dičiūnas, Ph.D. **Other lecturers:** assist. G.Skersys, assist. prof. G.Bareikis	Institute of Computer Science Faculty of Mathematics and Informatics Vilnius University

Cycle	Type of the course unit
1st (BA)	Compulsory

Mode of delivery	Semester or period when the course unit is delivered	Language of instruction
Face-to-face	Autumn semester	English

Prerequisites
Prerequisites: none

Number of credits allocated	Student's workload	Contact hours	Individual work
5	134	68	66

Purpose of the course unit: programme competences to be developed

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Purpose of the course unit is to develop student's ability to classify sets by cardinality, to formalize knowledge using propositional and predicate logic, to choose an appropriate model of computation. One of the aims of the course is to give a key knowledge in discrete mathematics. This knowledge should help to study other mathematical courses as well as to read mathematical literature. Another aim is to develop analytical skills that should allow to construct discrete models in practice as well as to solve real discrete problems.

Generic competences:
- Ability to analyse and organise the information *(GK1)*.
- Ability to apply the knowledge in practice *(GK2)*.

Specific competences:
- Analysis and applications of continuous and discrete mathematical structures *(SK4)*.
- Development of algorithms and their complexity evaluation *(SK5)*.
- Mathematical and computer modeling (*SK10*).
- Human factors and artificial intelligence (*SK11*).

Learning outcomes of the course unit: students will be able to	Teaching and learning methods	Assessment methods
- Apply discrete mathematics knowledge to construct discrete models in solving real-world problems. - Present knowledge (problems) using formulas of propositional and predicate logic. - Transform formulas into conjunctive and disjunctive normal forms. - Choose an appropriate model of computation and estimate problem complexity.	Problem-oriented teaching, discussions.	Two written tests during the semester. Wtitten examination at the end of the semester.

Course content: breakdown of the topics	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Practice	Laboratory work	Practical training	**Contact hours**	**Individual work**	**Assignments**
1. Fundamental discrete structures. Set operations. Venn`s diagrams. Functions and their properties. Cardinality. Finite, countable and noncountable sets. Theorems about cardinality of sets.	8			8			**16**	**14**	Reading textbooks. Solving exercises.
2. Propositional logic and its applications. Series-parallel circuits. Predicates and quantifiers. Formal theories and axiomatic method. Predicate calculus and its application in verifying the truth of logical reasoning.	8			6			**14**	**12**	
3. Proof techniques: direct proof, indirect proof, proof by contradiction.	4			2			**6**	**4**	
4. Relations, their properties and presentation. Equivalence and order relations. Partially ordered sets. Hasse diagrams.	4			4			**8**	**6**	
5. Finite computational models. Boolean functions and formulas. Boolean laws. Normal disjunctive and conjunctive forms. Complete systems of Boolean functions. Boolean circuits and their complexity. Binary adder.	8			8			**16**	**12**	
Tests				4			**4**	**4**	
Tutorial during semester		2					**2**		
Exam		2					**2**	**14**	
Total	32			32			**68**	**66**	

Assessment strategy	Weigh t %	Deadline	Assessment criteria
2 tests (written)	40		Each test consists of 4 exercises. Each exercise is evaluated from 0 to 0.5 points. Consequently, the total sum of points for two tests is equal from 0 to 4. Those students who collect in total 1 or less points from two tests are not allowed to pass an exam.
Exam (written)	60		Exam consists of theory questions and exercises (of diverse difficulty). One question requires complete proof of some theorem or proposition. Exam is evaluated from 0 to 6 points.

Author	Publishing year	Title	Number or volume	Publisher or URL
Required reading				
K. Rosen	2011	Discrete Mathematics and Its Applications, 7th edn.		McGraw-Hill, New York
J.L.Hein	2010	Discrete Structures, Logic, and Computability		Jones & Bartlett Learning
Recommended reading				
S.S. Epp	2011	Discrete Mathematics with Applications, 4th edn.		