Title	Code
Introduction to Logic and Set Theory	**1010341511010340705**
Field: **Mathematics**	Year / Semester: **1 / 1**
Specialty: **-**	Course: **core**
Hours: Lectures: **2** Classes: **2** Laboratory: **-** Projects / seminars: **-**	Number of credits: **9**
	Language: **polish**

Lecturer:

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Status of the course in the study program:

Obligatory course of the study program for Matematics at the Faculty of Electrical Engineering.

Assumptions and objectives of the course:

The goal of this course is to introduce students to mathematical logic and set theory, which are basic foundation parts of all mathematics. Students' preparation to carrying out correct reasonings. In peculiarity in argumentation statements; in the executing of operations on sets and functions; in interpreting the questions with different fields of mathematics in language of set theory; in understanding the questions with different kinds of infinity and types of ordered sets.

Contents of the course (course description):

1. Alphabet and formulas of propositional logic language. Propositional operators. Polish notation and opposite Polish notation. Primitive notions, definitions; statements and axioms. Truth tables and tautologies. Normal forms of logic formulas. Principle and fundamental laws of propositional calculus. Application of the laws of the logic of propositions in derivations and inference. Law of deduction and formal character of deductive sciences.

2. Logical inference rules and their application in formal proofs. Useful tautological implications. Basic methods in argumentation truth. Teorem of logic. Basis rules and conceptions of proper definitions and proofs in deductive theories.

3. Universal and existential quantifiers and predicate logic. Bound and free variables. Laws of quantifiers calculus. Interchange of quantifiers. Summary of rules of inference.

4. Formal bases of set theory. The system of Zermelo - Fraenkl axioms and its basic consequences. Inclusion. The empty set. Operations on sets. Power set. Principles and lows about operations and generalized operation on sets.

5. Ordered couples. Theorem about existence of Cartesian product of sets. Generalized Cartesian product. Binary and multinary relations. Calculus on relations. Some properties and proofs of binary and multinary relations. The types of binary relations and their geometrical properties. Equivalence relations and partitions. Principle of abstraction. Integer numbers. Inductive proofs. Theory set construction of integer numbers, rational numbers and real numbers.

6. One and many variables functions as a special type of relations. Injectivity, surjectivity, bijectivity, composition, invers function. Theory set operations on functions. One-to-one correspondence between sets. Cardinality, countable and uncountable sets. Arithmetic of cardinal numbers. Cantor?Bernstein theorems.

7. Ordering relations. Some types of ordering and their arithmetic. Limited set. Special elements. Chains and antychains. Lattices. Homomorphisms. Orders on Cartesian product of totally ordered

sets. Continuous ordering. Well ordered spaces. Kuratowski ? Zorn Lemma. Further topics including mathematical applications of set theory.

Introductory courses and the required pre-knowledge:

Mathematical knowledge of secondary school.

Courses form and teaching methods:

Lecture and practical training

Form and terms of complete the course - requirements and assessment methods:

Regular written tests and written/oral final exam.

Basic Bibliography:

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Additional Bibliography:

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