Study programmes: Master studies – Mathematics

Course name: 2M1.04 Selected Topics of Mathematical Logic

Lecturers: Milan Božić, Zoran Petrović

Status: Optional

ECTS: 8

Attendance prerequisites: Introduction to Mathematical Logic, Algebra 1, Analysis 1

Course aims: Acquisition of extensive knowledge of Mathematical Logic.

Course outcome: Upon completion of the course, the students have advanced knowledge of Mathematical Logic. The students understand the following concepts: formal language, formal systems, completeness, computability, ordinals, cardinals. The students know fundamental results of Mathematical logic and some advanced topics in contemporary mathematical logic. They will be able to solve problems in the field, and to attend advanced courses in which the acquired concept and techniques should be applied.

Course content:
Introduction: Boolean algebras and rings. Lindenbaum algebra.
Predicate formulas. Language, Resolution, Valid formulas; Equational Logic
Proof theory: Hilbert system, Propositional logic, Predicate logic; Natural deduction.
Model theory: Tarskian semantics. Completeness and Compactness. Introduction to nonstandard analysis. Models of arithmetic. Ultraproducts.
Theory of algorithms. Models of computability: Turing machines, Recursive functions. Numberings, Representability of Recursive functions and relations in PA, Gödel's first and second incompleteness theorem, the undecidability of arithmetic
Set Theory. Axiomatic set theory: ZFC, NBG. Well ordering. Ordinal and cardinal. Axiom of choice and its equivalents. Famous problems of Set theory (the continuum hypothesis, the Suslin hypothesis, the Kurepa hypothesis). Models of set theory and Independence proofs.

Literature:
Slaviša Prešić, *Elementi matematičke logike*, Zavod za izdavanje udžbenika i nastavna sredstva, Beograd, 1983;
A. Perović, A. Jovanović, B. Veličković, *Teorija skupova*, Matematički fakultet, Beograd, 2007;
Ž. Mijajlović, *An introduction to model theory*, PMF Novi Sad, 1987.

Number of hours: 5	**Lectures: 3**	**Tutorials: 2**	**Laboratory: -**	**Research: -**

Teaching and learning methods: Lectures / Tutorials / Project

Assessment (maximal 100 points)

Course assignments	**points**	**Final exam**	**points**
Lectures	-	Written exam	20
Exercises / Tutorials	-	Oral exam	40
Colloquia	20	Written-oral exam	-
Essay / Project	20		