Program	Level	Third cycle
	Name of the program	Natural and mathematical sciences in education

COURSE

Course title	**Selected chapters of mathematical logic**			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
PMAT 651	II	Elective course	10	2+2+0
Lecturer	**Prof. Dr. Dženan Gušić**			
Course Goals				

COURSE CONTENT

Introductory class: introducing students to the course

- Truth on algebraic systems:

  Signature. Algebraic signature system. Signature interpretation. Homomorphisms of algebraic systems. A subsystem of the algebraic system. Assertion about the existence and uniqueness of the subsystem generated by the set. Assertion about the existence and uniqueness of the union of algebraic systems. Examples of algebraic systems. Ordered sets. The assertion about isomorphic orderings. Signature formulas. Sets of variables. Terms of signatures. Interpretations of variables from subsets of sets. Assertion of a subsystem support generated by a set of signature formulas. Subformulas of formulas, atomic formulas. Symbols of equality, the universal quantifier, existential quantifier. Quantorless formulas. Assertion about signature formulas and subformulas. Scope of the quantifier (free and bound variable). The truth of the formula in the interpretation: Types of signature formulas: (closed, identically true, satisfiable, n-general). Signature sentences.

  Algorithm Existence Claim. Claim about the existence of an n-general signature sentence. Compactness theorem. The notion of a lattice and Boolean lattices. Boolean lattice claim. Boolean algebra. Lemma on properties of Boolean operations. Boolean Algebra Filters. The ultrafilter claim. Filtered product and D-filtered product. Homomorphism claim. D-filtered formulas. Lemma on D-filtered formulas. Lemma on atomized formulas and filters. Los' theorem. A subset model of a set of formulas. The compactness theorem and its consequence (on the existence of models).

- Predicate calculus (PC)

  Axioms and rules of derivation of signature predicate calculus. Linear proof and tree proof in PC. PC-provable sequence. Theorem on PC-provable sequences. PC-tautologies. Assertion of PC-allowable rules. Claim about the PC-provability of equality properties. Theorem on conservative expansion of PC calculus.

  Semantic equivalence of PC-formulas and basic theorems about them. Normal forms of PC-formulas (definition and basic theorems). Theorem on the existence of models. Goedel's theorem on the completeness of PC-calculus. Model cardinality theorem.

LITERATURE

[1] Dž. Gušić, Aksiomatizacija Fuzzy i Vague Funkcionalnih i Višeznačnih Zavisnosti u Relacijama Baza Podataka, Prirodno-matematički fakultet Univerziteta u Sarajevu, Sarajevo, 2021.
[2] G. T. Kneebone, Mathematical logic and the foundations of mathematics, D. Van Nostrand Company Limited, London, 1963.
[3] E. Mendelson, Introduction to mathematical logic, Chapman and Hall, London, 1997.
[4] I. Chiswell and W. Hodges, Mathematical logic, Oxford University Press, 2007.

STUDENT WORKLOAD (hours in semester)

Lectures	30	Exercises	30

GRADING

Criterion	Maximum points	Minimum points
Midterm exams	100	55
Final exam	100	55
T o t a l	100	55

REMARKS