Set Theory

2024 Fall

Lecturer: Zalán Molnár

Description

Set theory is a branch of mathematical logic providing a foundation for mathematics. This course introduces all the basic concepts and results of Zermelo-Fraenkel set theory with axiom of choice (ZFC), which are inevitable for any further studies in mathematical logic. Therefore it is highly recommended to everyone in the first year of the Logic and Theory of Science program, since it makes the logic lecture and seminar complete. Although no specific mathematical background is required, we assume a certain level of maturity in abstract thinking in order to acquire the material.

- **Class 1-3.** Axiom of extensionality, Axiom of empty set, Axiom of pairs, Axiom of unions, Axiom of separation, Axiom of powerset, Axiom of infinity, Axiom of replacement, basic notions (eg. union, intersection, indexed family, ordered pairs, relations)
- **Class 4-5.** Axiom of foundation, Axiom of choice, Cantor's theorem, Schröder-Bernstein theorem, Countable of countable unions is countable.
- **Class 6.** Examples,
- Well orderings, transitive sets
- **Class 7.** Ordinal numbers
- **Class 8.** Transfinite recursion, transfinite induction,
- **Class 9.** Ordinal arithmetics
- **Class 10.** Cardinal numbers
- **Class 11.** Cardinal arithmetics
- **Class 12.** Zorn's Lemma

Evaluation

Students will be evaluated based on:

- homework assigments
- oral exam

References

[1] András Hajnal, Peter Hamburger. *Naive Set Theory.* Springer. 1974.

[2] Paul R. Halmos. *Set Theory.* London Mathematical Society. 1999.

[3] Thomas Jech. *Set Theory.* Springer. 2006.