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# Philosophy of Mathematics

A proposal of a seminar for Erasmus+ 2018/2019

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## Course Description

In the course we will try to understand the most important issues of philosophy of mathematics. We will focus on questions such as the following: What is mathematical knowledge? Is it true? Is it free of lacks and absolutely certain? What is the role of mathematics in science? Do entities of mathematics like numbers, points, lines, spheres, sets – really exist? What does it mean “to prove” a theorem? Where are the limits of mathematics? What is the future of mathematics?

## Main topics:

- 1) The ancient concept of number.
- 2) Geometric and arithmetic paradigm in Greek mathematics.
- 3) Zeno’s paradoxes.
- 4) Construction of the real numbers by Dedekind and Cantor.
- 5) The problem of the mathematization of nature.
- 6) Euclid’s parallel postulate and non-Euclidean geometries.
- 7) Set theory and reconstruction of mathematics.
- 8) Mathematical theory of actual infinity.
- 9) The problem of consistency of mathematical theories.
- 10) Hilbert’s program of and the foundations of mathematics.
- 11) Logicism of Whitehead and Russell.
- 12) Mathematical constructivism and intuitionistic logic.
- 13) Completeness, decidability and categoricity of mathematical theories.
- 14) Gödel’s incompleteness theorems and its philosophical meaning.

**Prerequisites:**

None.

**Form of assessment**

Attendance, active participation in classes, presentation.

**Recommended literature**

- [1] S. Shapiro, *Thinking about Mathematics. The Philosophy of Mathematics*, Oxford University Press, New York 2000.
- [2] L. Horsten, *Philosophy of Mathematics*, in: **Stanford Encyclopedia of Philosophy**, 2017: <https://plato.stanford.edu/entries/philosophy-mathematics/>
- [3] R. Zach, *Hilbert's Program*, in: **Stanford Encyclopedia of Philosophy**, 2015: <https://plato.stanford.edu/entries/hilbert-program/>
- [4] E. Nagel, J. R. Newman, *Gödel's Proof*, New York University Press, New York and London 2001.
- [5] J. R. Brown, *Philosophy of Mathematics. A Contemporary Introduction to the World of Proofs and Pictures*, Routledge, New York and London 2008.