

M069	Elective - Year 4	<b>Non-Euclidean Geometry</b>	L+P+S 2+1+0	ECTS 4
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**Course objectives.** To inform students about basic concepts, results and assertions of classical non-Euclidean geometry being the result of the efforts to find solutions to the famous problem of parallels, with the treatment of Euclidean and Hilbert's axioms.

**Course prerequisites.** Elementary Geometry.

### Syllabus.

1. The *historical review* of the *axiomatic* foundation of *geometry*. Geometry before Euclid. Euclid and his Elements. Content and criticism of the first book of Elements. The attempts to prove Euclid's Parallel Postulate. The forerunners of the non-Euclidean geometry. The founders of the non-Euclidean geometry. Later development of the non-Euclidean geometry. Further construction of non-Euclidean geometry and solving the problem of the axiomatic foundation of the geometry.
2. The contemporary axiomatic of geometry, Hilbert's axiomatic.
3. The geometry of the hyperbolic plane. Axiomatic foundation of the hyperbolic geometry. Parallelism in the hyperbolic geometry. Circle in the hyperbolic geometry. Hyperbolic trigonometry.

### Expected learning outcomes.

After completing the course, students are expected to:

- have knowledge of the historical development of axiomatic foundation of geometry;
- know the axioms of modern geometry;
- demonstrate understanding of the concepts of hyperbolic geometry;
- interpret mathematical terms introduced during the course;
- mathematically prove the soundness of all procedures and formulas used in this course.

**Teaching methods and student assessment.** Lectures and exercises are obligatory. The final exam follows after the completion of lectures and exercises and it consists of two parts, written and oral. During the semester, students have two mid-term exams which cover the whole teaching material. Acceptable mid-term exam scores replace the written examination.

**Can the course be taught in English:** Yes.

### Basic literature:

1. R. Bonola, Non-Euclidean geometry, Dover Publications, Inc., New York, 2004.

### Recommended literature:

1. Euklid, Elementi I-VI, Kruzak, Zagreb, 1999.
2. J. L. Trajnin, Osnovaniya geometrii, Učpedgiz, Moskva, 1961.