

M056	Elective - Year 5	<b>Pupils' Mathematics Competitions</b>	L+P+S 1+0+1	ECTS 3
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**Course objectives.** The aim of the course is to train students for independent and projective work: research, finding and searching the literature (at all available media - printed and electronic, especially on the Internet), preparation of seminar papers (by means of a computer) and oral presentation of the topic covered in classes. Specifically, students will be informed about topics in elementary mathematics intended chiefly to work with mathematical gifted pupils in primary and secondary schools – for mathematical groups and preparation for mathematical competitions. Topics are chosen so that they enable training of students, future teachers of mathematics, for recognition of individualization and problem area as fundamental principles of mathematics classes at all levels of education.

**Course prerequisites.** Materials from previous years of mathematical study.

### Syllabus.

1. Number theory – divisibility, prime numbers and diophantine equations.
2. Polynomials (nullpoints and factorizations) and functional equations.
3. Application of mathematical induction.
4. Complex numbers and applications.
5. Inequalities (inequalities between means, some well known inequalities, trigonometrical inequalities).
6. Geometrical constructions.
7. Planimetry (figures in a plane).
8. Application of trigonometry in planimetry and solid geometry.
9. Application of vectors in planimetry.
10. Special topics.

### Expected learning outcomes.

After completing the course, students are expected to:

- research literature (in printed and electronic form on the Internet) for work with gifted pupils;
- select appropriate tasks for preparation of students for mathematical competitions;
- analyze types of problems which appear in competitions and explain them to pupils;
- apply known methods and techniques for solving mathematical tasks and problems in particular areas of elementary mathematics in number theory, equations, geometry;
- organize adjusted individual work with mathematically gifted pupils.

**Teaching methods and student assessment.** Attendance at lectures and seminars is obligatory. Students should present their seminar papers in which they elaborate a certain topic of mathematics, whereby they select examples and tasks intended for appropriate age of pupils in primary or secondary school. Students are graded on the basis of an oral exam, seminar paper in its written form and oral presentation.

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

### Basic literature:

1. B. Pavković i dr., Male teme iz matematike, Mala matematička biblioteka, HMD, Zagreb, 1994.
2. V. Stošić: *Natjecanja učenika osnovnih škola*, HMD, Zagreb, 2000.
3. A. Dujella, M. Bombardelli, S. Slijepčević: *Matematička natjecanja učenika srednjih škola*, HMD/ Element, Zagreb, 1996.

**Recommended literature:**

1. *Mathematics Competitions*, HMD and Element  
<http://public.carnet.hr/mat-natj/index.htm>