

M064	Elective - Year 3	<b>Inequalities</b>	L+P+S 1+1+0	ECTS 3
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**Course objectives.** To acquire basic knowledge of classical inequalities and their applications in different parts of mathematics.

**Course prerequisites.** Differential Calculus. Integral Calculus. Functions of Several Variables. Linear Algebra I.

**Course content.**

1. Convex functions. Jensen's inequality. Jensen-Steffensen inequality. Hermite-Hadamard inequality.
2. Classical means and their inequalities. Arithmetic, geometric, harmonic and quadratic mean and related inequalities. Power mean.
3. Inequalities derived from Jensen's inequality. Cauchy's inequality. Hölder's inequality. Minkowski's inequality.
4. Monotone functions and inequalities. Chebyshev's inequality. Young's inequality.

**Expected learning outcomes.**

After completing the course, students are expected to:

- understand and apply fundamental inequalities;
- use Jensen's inequality and inequalities derived from Jensen's inequality;
- use classical means and related inequalities;
- solve problems in different parts of mathematics via using fundamental inequalities;
- mathematically prove validity of the method and formula used in this course.

**Teaching methods and student assessment.** Lectures and exercises are obligatory. The final examination consists of a written and an oral part and it is taken upon the completion of lectures and exercises. During the semester, students can take mid-term exams, which, if successful, can replace the written part of the final examination. By writing a seminar paper during the semester, students can improve their final grades.

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

**Basic literature:**

1. J. Pečarić, Nejednakosti, Element, Zagreb, 1996.

**Recommended literature :**

1. P. Cerone, S. S. Dragomir, Mathematical Inequalities, CRC Press, New York, 2011.
2. D. S. Mitrinović, J. E. Pečarić, A. M. Fink, Classical and New Inequalities in Analysis, Kluwer Academic Publishers, Dordrecht, 1993.
3. J. E. Pečarić, F. Proschan, Y. L. Tong, Convex Functions, Partial Orderings and Statistical Applications, Academic Press, London, 1992.
4. J. E. Pečarić, Konveksne funkcije i nejednakosti, Naučna knjiga, Beograd, 1987.
5. J. M. Steele, The Cauchy-Schwarz Master Class, Cambridge University Press, Cambridge, 2004.