M109	**Convex Functions**	L	P	S	ECTS
		1	1	0	3

Course objective. The aim of the course is to systematize geometric and analytical properties of convex sets and convex functions, which are used in various fields of applied mathematics.

Prerequisites. Undergraduate mathematics or computer science study programme.

Course content.

1. Convex sets. The definition of a convex set. Examples of convex sets. Operations that preserve convexity. Generalized inequality. Hyperplanes and theorems of separation.
2. Convex functions. Convex functions and characterizations. Convex functions defined on a convex set. Conjugated functions. Quasi-convex function. Log-convex function and a log-concave function. Convex functions and inequalities. Convexity and majorization.

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Differentiate and provide examples of typical convex and non-convex sets.
2.	Differentiate and provide examples of convex and no-convex function.
3.	Analyze geometric and analytic properties of convex sets and convex functions.
4.	Solve problems in various fields of applied mathematics using properties of convex functions.
5.	Use different sources of mathematical literature and apply at least one programming tool for illustration of various examples.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Attending lectures and exercises	1	1-5	Lecture attendance, discussion, team work and independent work on given tasks	Attendance lists, tracking activities	0	4
Written exam (Mid-terms)	1	1-5	Preparing for the written exam	Evaluation	25	48
Final exam	1	1-5	Revising	Oral exam	25	48
TOTAL	3				50	100

Teaching methods and knowledge assessment. Lectures and exercises are mandatory. The exam consists of written and oral part, which can be taken after the completion of lectures and exercises. During semester, students can take mid-terms which can replace the written examination.

Can a subject taught in English: Yes

Basic literature:

1. S. Boyd, L. Vandenbergher, Convex Optimization, Cambridge University Press, Cambridge, 2004

2. M. Alić, G. Nogo, Optimizacija: Uvod u teoriju nužnih i dovoljnih uvjeta ekstrema, Odjel za matematiku, Sveučilište u Osijeku, 2004.

Recommended literatura:

1. D. Bertsimas, J. N. Tsitsiklis, Introduction to Linear Optimization, Athena Scientific, 1997.
2. J. M. Borwein, A. S. Lewis, Convex Analysis and Nonlinear Optimization, Springer-Verlag, New York, 2000.
3. J. Pečarić, F. Proschan, Y. L. Tong, Convex Functions, Partial Orderings and Statistical Applications, Academic Press, London, 1992
4. A. W. Roberts, D. E. Varberg, Convex Functions, Academic Press, New York, 1973