M111	**Normed spaces**	L	E	S	ECTS
		2	2	0	6

Objectives. To inform students about the basic of the theory of normed spaces, with special attention on Banach and Hilbert spaces.

Prerequisites. Knowledge of basic results of the real analysis.

Course content.
1. Inner product spaces and normed spaces. Banach and Hilbert spaces. Subspaces of normed spaces. Convexity in the normed space.
2. Orthonormal basis of the Hilbert space. Fourier series. Parseval equality. Bessel inequality. Topological basis of the normed space. Hölder and Minkowski inequality. l^p spaces.
3. The best approximation. Riesz theorem of projection in the Hilbert space. Continuous linear functionals on the Hilbert space.
4. Dual space of the normed space. Hahn-Banach theore. Geometric form and consequences.
5. Bidual of the normed space and reflexivity. Completition of the normed space. Quotient space.
6. L^p spaces and spaces of continuous functions. Their dual spaces. Weak and weak* convergence.
7. Bounded operators. Spectrum of the operator.

EXPECTED LEARNING OUTCOMES

No.	**LEARNING OUTCOMES**
1	Understand the basic notions regarding normed and inner product spaces.
2	Resolve based on arguments which mathematical structures are needed to prove the most important claims of the functional analysis, and which are not.
3	Know and understand the most important results of the subject, such as Hahn-Banach theorem, as well as their consequences.
4	Formulate conjectures related to the subject, and prove or deny them.
5	Reproduce correct proof of mathematical claims by applying the basic concepts of concluding and mathematical logic.

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

ORGANIZATION OF THE EDUCATIONAL PROCES	ECTS	LEARNING OUTCOMES **	STUDENT ACTIVITIES *	METHOD OF ASSESSMENT	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)	2	1-5	Preparing for written exam	Evaluation	25	48
Final exam	3	1-5	Revision	Oral exam	25	48
TOTAL	6				50	100

Teaching methods and student assessment. Lectures and exercises are obligatory. The exam consists of a written and an oral part. Upon completion of the course, students can take the exam. Successful midterm exam scores replace the written exam.

Can the course be taught in English: Yes

Basic literature:

1. S. Kurepa, Funkcionalna analiza, Školska knjiga, Zagreb, 1981.
2. G. Bachman, L. Narici, Functional analysis, Dover Publications, Mineola, New York, 2000.

Recommended literature:

1. H. Brezis, Functional Analysis, Sobolev Spaces and Partial Differential Equations, Springer, New York, 2011.