

Study Program: Mathematics			
Type and level of studies: Bachelor studies, VIII semester			
Course name: Functional analysis			
Lecturer: Jelena Z. Vujaković			
Status: Compulsory			
ECTS: 7			
Attendance Prerequisites: Real analysis			
Course aims			
Introduction to basic topological properties of Banach’s and Hilbert’s spaces, as well as the theory of operators and its application.			
Course outcome			
The students have grasped the basic concepts of Banach and Hilbert space theories, as well as the basic techniques of working with operators thus defined. They have developed the ability to apply abstract mathematical theories in solving specific problems of applied mathematics and natural sciences.			
Course content			
<i>Theoretical classes:</i>			
Banach's premises. Basic terms, definitions, features and examples. Limited linear operators. Limited linear functionals. Dual space. Khan-Banach's theorem. The principle of uniform constraint. Convergence principle. Banach-Steinhaus theorem. Compact linear operators. Open mapping theorem. Closed graph theorem. Reflective Banach spaces. Poor convergence. Integral transformations and their applications. Banach algebras. Spectral operator theory. Fredholm's alternative and its applications in the theory of integral equations.			
Hilbert spaces. Orthonormal base. Gram-Schmidt procedure. Abstract Fourier series. Applications in the theory of special functions. The best approximation theorem. Projection theorem. Representation of bounded linear functionals. Adjusted and normal operators.			
Nonlinear operators. Schauder theorem and its applications. Calculus of variations elements.			
<i>Practical classes: Exercises, Other forms of teaching, Study research work</i>			
Classroom exercises follow the course of lectures, on the same thematic units. The exercises also include consultations for the preparation of a seminar paper that is done in the field of application of functional analysis (integral transformations, Fredholm's alternative, special functions or variational calculus).			
Literature			
1. С. Аљанчић, Увод у реалну и функционалну анализу, Завод за уџбенике, Београд 2012.			
2. Д. Кечкић, Анализа 3, збирка задатака, „Кечкић“, Београд 2005.			
3. В. Ракочевић, Функционална анализа, „Научна књига“, Београд 1984.			
Number of active classes		Lectures: 3	Practical classes: 3
Teaching methods			
Frontal, group, interactive.			
Assessment (maximum 100 points)			
Course assignments	points	Final exam	points
activity during lectures	5	written exam	35
practical classes	-		30
term test(s)	10		
seminar(s)	20		
Total	35		65