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| **Course code** | CC5 |
| **Type and description** |  |
| **ECTS credit** | 1 |
| **Course name** | **Applied Functional Analysis 1** |
| **Course name in Polish** | **Stosowana analiza funkcjonalna 1** |
| **Language of instruction** | English |
| **Course level** | 8 PRK |
| **Course coordinator**  | **Jacek Jachymski** |
| **Course instructors** | **Jacek Jachymski and Bogdan Przeradzki** |
| **Delivery methods and course duration** |

|  | **Lecture** | **Tutorials** | **Laboratory** | **Project** | **Seminar** | **Other** | **Total of teaching hours during semester** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Contact hours | 15 | 0 | 0 | 0 | 0 | 0 | 15 |
| E-learning | No | No | No | No | No | No |  |
| Assessment criteria (weightage) | 1,00 |  |  |  |  | 0,00 |  |

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| **Course objective** | 1. Extending knowledge in the field of weak topologies and its applications to extreme problems. 2. Acquiring knowledge on applications of fundamental theorems of functional analysis.  |
| **Learning outcomes** | After the course a student is able to:1. Search the weak compactness of sets and weak continuity of functionals – outcomes W1, U2, K1.2. Look for solutions of some algebraic equations in Banach spacesusing operatortheory – outcomes W2, U1, K1-K3.3. Calculate an approximate value of some integrals and an error of estimate - outcomes U1, K1-K3.4. Find solutions of some differential equations in Banach spaces with the help of an exponential of operator – outcomes W2, U1, K1-K3. |
| **Assessment methods** | Outcomes W1-2, U1-2 –oralexam |
| **Prerequisites** | Knowledge of basic theorems of functional analysis |
| **Course content with delivery methods** | 1. Weak topology, weak compactness, a generalized Weierstrass theorem for weakly sequentially continuous functionals on subsets of reflexive Banach spaces. 2. The Hahn-Banach theorem and its applications: separation of convex sets, minimum norm problem, Cebysev approximation.3. The Banach-Steinhaus theorem. Application: a general theorem on convergence of cubature formulas, the trapezoid formula. 4. Completeness of the operator algebra. Applications: exponential of operator, solving some algebraic and differential equations in Banach spaces.  |
| **Basic reference materials** | Lecturer’s materials,1. A. Bobrowski, Analiza funkcjonalna jeden i pół. Szkic o zupełności, Politechnika Lubelska, Lublin 2015.2. E. Zeidler, Applied Functional Analysis. Main Principles and Their Applications, Springer-Verlag, New York 1995. |
| **Other reference materials** | W. Rudin, Analiza funkcjonalna, PWN, Warszawa 2018. |
| **Average student workload outside classroom** | 10h |
| **Comments** |  |
| **Last update** |  |