Course: Fredholm theory

Teacher(s): Snežana Živković Zlatanović

Course status:	Elective
ECTS:	12

Prerequisites: None

Goal

Mastering results in Fredholm theory, compact and Riesz operators, Fredholm alternative and index theory.

Outcomes

Students can research current achievements in the area of bounded Fredholm and semi-Fredholm operators, Weyl and Browder operators, Riesz operators and spectral theory related to these operators.

Contents

Theoretical lectures

Nullity and defect. Bounded semi-Fredholm and Fredholm operators. Connection with Calkin algebra. Left and right Fredholm operators. Ascent and descent of operators. Browder operators.
Openness of the set of Fredholm operators and the set of proper semi-Fredholm operators. Semi-Fredholm domain of operator. Perturbation classes. Upper and lower Weyl operators. Left and right Weyl operators. Riesz operators. Kato decomposition theorem.

Fredholm, upper and lower semi-Fredholm, upper and lower Weyl, upper and lower Browder essential spectrum. Boundaries of essential spectra. Essential spectral radius and semi-Fredholm radius. Perturbations of essential spectra. Spectral mapping theorems. Zemanek's method of removing jumping points. Compressions.

Recommended bibliography.

1. S. Č. Živković-Zlatanović, V. Rakočević and D. S. Đorđević, *Fredholm theory*, Prirodno-matematički fakultet, Niš.
2. S.R. Caradus, Pfaffenberger and B. Yood, Calkin algebras and algebras of operators on Banach spaces,Marcel Dekker, 1974.
3. V. Muller, Spectral theory of linear operators and spectral systems in Banach algebras, Birkhauser, 2007.
4. P. Aiena, Fredholm and local spectral theory with applications to multipliers, Kluwer, 2004.
5. M. Schechter, Principles of Functional Analysis, Academic Press, New York, 1971.

Number of classes per week	Theoretical: 4	Practical:

Methods of teaching

Group, individual, interactive.

Knowledge rating (max 100 points)

Knowledge estimation:
Seminars: 30 points
Final exam: 70 points