

ALGEBRAIC GRAPH THEORY

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Course description: Algebraic graph theory is a very vast area of mathematics. There are three main branches of Algebraic graph theory ; the first one uses linear algebra, the second one uses group theory, and the third one studies graph invariants. In this course our main tool will be the combination of linear algebra and group theory to tackle problems about graphs. We will cover the followings:

- Basics on graph theory
- Cayley graphs and their properties
- Representation theory and linear algebra methods
- Association schemes

The following applications will be discussed:

- Erdős-Ko-Rado theorem for permutation groups
- Integral graphs
- Perfect codes on Cayley graphs
- Permutation codes

Prerequisites:

- Linear algebra
- Group theory
- Knowledge in representation theory will be helpful.

References:

- Chris Godsil, Karen Meagher. *Erdős-Ko-Rado theorems. Algebraic approaches*. Cambridge Studies in Advanced Mathematics 149. Cambridge: Cambridge University Press (2016).
- Chris Godsil, Gordon Royle. *Algebraic Graph Theory*. Graduate Texts in Mathematics 207 (2001).