



Graph Theory Seminars

Venerdì 10 luglio 2026

AULA M2.2 (secondo piano) · Dipartimento FIM · via Campi 213/b · Modena

11.30 – 12.30

On the existence of factors intersecting sets of cycles in regular graphs

Davide Mattiolo

KU Leuven (Belgium)

A recent result by Kardos, Macajova and Zerafa related to the famous Berge-Fulkerson Conjecture implies that given an arbitrary set of odd pairwise edge disjoint cycles, say O , in a bridgeless cubic graph, there exists a 1-factor intersecting all cycles in O in at least one edge. This remarkable result opens up natural generalizations in the case of an r -regular graph G and a t -factor F , with t and r being positive integers. In this work, we start the study of this problem by proving necessary and sufficient conditions on G , t and r to assure the existence of a suitable F for any possible choice of the set O . First of all, we show that G needs to be 2-connected. Under this additional assumption, we highlight how the ratio t/r seems to play a crucial role in assuring the existence of a t -factor F with the required properties by proving that t/r at least $1/3$ is a further necessary condition. We suspect that this condition is also sufficient, and we confirm it in the case $t/r=1/3$, generalizing the case $t=1$ and $r=3$ proved by Kardos, Macajova, Zerafa, and in the case $t/r=1/2$ with t even. Finally, we provide further results for the case where even cycles are included.

14.30 – 15.30

The probabilistic method in combinatorics

Amedeo Sgueglia

University of Passau (Germany)

The “probabilistic method” is a powerful and versatile tool in combinatorics. The essence is that, to prove that an object with certain properties exists, it suffices to show that if the object is chosen at random, then it has the desired properties with positive probability. In the first part of the talk, we survey some classical applications. In the second part, we present a more recent application to discrepancy problems, obtained in joint work with Lior Gishboliner and Stefan Glock. Here the question is whether, for a given host graph, any r -colouring of its edges must contain a specified subgraph with high discrepancy, meaning that within this subgraph one colour class is significantly larger than each of the other ones.