Lecture Hall **M1, 4:00 pm, 27 March, 2024**

Speaker: **Pablo Candela** (Autonomous University of Madrid), http://verso.mat.uam.es/~pablo.candela/

Title: **Generalizing Fourier analysis using nilspace theory**

Abstract:

Many applications of Fourier analysis in combinatorics rely on the following idea: the averages of a function over certain linear configurations in an abelian group can be usefully analyzed by approximating the function with its dominant Fourier components. A far-reaching extension of this idea was initiated in the seminal work of Gowers on Szemerédi's theorem in the 1990s, leading to the theory known as higher-order Fourier analysis. A fundamental insight in this theory is that for many types of linear patterns, while the dominating Fourier components may not be helpful anymore, one can instead analyze the function effectively by approximating it with components that are based, not on the circle group (like classical Fourier characters), but rather on certain non-commutative extensions, such as nilmanifolds. This has led notably to the discovery of fascinating structures called nilspaces, which are a common generalization of abelian groups and nilmanifolds, and which have yielded further progress in higher-order Fourier analysis. I will give an introduction to this theory and discuss some recent results in this approach involving nilspaces, based on joint work with Balázs Szegedy.