Department of Mathematics, BGU

# BGU Probability and Ergodic Theory (PET) seminar

**On** *Thursday, December ,15 2022*

**At** *11:10 − 12:00*

**In** *101-*

Or Shalom (Institute of advanced studies)

will talk about

## Structure theorem for the Gowers-Host-Kra seminorms

Abstract: Szemeredi's theorem asserts that in every subset of the natural numbers of positive density one can find an arithmetic progression of arbitrary length. In ,2001 Gowers gave a quantitative proof for this theorem. A key definition in his work are the Gowers norms which measure the randomness of subsets of the natural numbers. Inspired by Furstenberg's ergodic theoretical proof of Szemeredi's theorem, Gowers proved the following dichotomy: Either the given set is close to a random set with respect to these norms, or it admits some algebraic structure. Gowers then proved that in each of these cases Szemeredi's theorem holds. Later, Host and Kra studied the structure of certain ergodic systems associated with an infinitary version of the Gowers norms. Inspired by their work, Green, Tao and Ziegler improved Gowers' structure theorem showing that

a function (or a set) with large Gowers norm must correlate with a nilsequence. This result is known as the inverse theorem for the Gowers norms. Recently, Jamneshan and Tao proved (roughly speaking) that a generalization of the Host-Kra theorem for ergodic systems associated with actions of the largest countable abelian group $\mathbb{Z}^{\omega}$ will imply the most general version of the inverse theorem for the Gowers norms. In this talk I will survey the above in more detail and mention some recent developments about these structure theorems.