

Department of Mathematics, BGU

Colloquium

On *Tuesday, December ,27 2022*

At *14:30 – 15:30*

In *Math 101-*

Tobias Hartnick (KIT)

will talk about

Some recent developments in mathematical quasicrystals

Abstract: 40 years after the discovery of quasicrystals, the mathematical theory around these objects is currently entering into a new phase. While the original goal of mathematical modelling of quasicrystalline materials has largely been achieved, many open questions remain.

One fundamental insight from the early days of quasicrystals is that questions about discrete structures can be attacked by methods from dynamical systems, ergodic theory and harmonic analysis. Over the last decade, attempts were made to use this dynamical approach in a broader context, for example to study quasicrystal-like discrete structures in non-Euclidean geometries. This has created new connections to different areas of mathematics, including rigidity theory of lattices, quasimorphisms, model theory, and non-abelian harmonic analysis, which as a byproduct also provide us with new tools to study classical problems. At the same time, recent progress in the theory of point processes has also lead to

the discovery of new phenomena concerning classical quasicrystals, for example some surprising connections to diophantine approximation.

We thus believe that it is a good time to take another look at the classical theory of quasicrystals and see what modern methods have to say about some of the classical problems in the area. We will start from the early beginnings of the theory and then point out a few of the many recent discoveries.