Department of Mathematics, BGU

# Noncommutative Analysis

**On** *Monday, June ,13 2022*

**At** *11:00 – 12:00*

**In** *seminar room, minus 101*

N. Christopher Phillips (University of Oregon)

will talk about

## Gap labelling for electron motion in quasicrystals and C*-algebra of minimal actions of Z^d on the Cantor set

Abstract: This talk will be a survey of the mathematics of the gap labelling problem for quasicrystals, but will assume no knowledge of physics.

In one standard approximation, the possible energy levels of an electron moving in a crystal form a collection of bands. These energy levels constitute the spectrum of a suitable Schrdinger operator, and the gaps between the bands are gaps in the spectrum.

Quasicrystals are not periodic, but exhibit long range order. The structure of the spectrum of the Schrdinger operator for quasicrystals is addressed by the "Gap Labelling Conjecture''. This conjecture was made in ,1989 and some results are known.

An infinite quasicrystal has an associated action of $\mathbb{Z}^d$ on the Cantor set $X$, and thus a transformation group C*-algebra $A$. The physics is supposed to give an invariant measure on $X$, and hence a tracial state on $A$. The gaps in the spectrum of Schr"{o}dinger operator correspond to the values of this tracial state on projections in $A$, and the Gap Labelling Theorem states that these values all already occur as values of the measure on compact open subsets of $X$.

In this talk, I will give a more careful description of the situation, including sketches of how the objects above are constructed and how they are related to each other. Then I will say something about the results that have been proved, and outline what goes into their proofs.

**Please Note the Unusual Place!**