

FIM

Nachdiplomvorlesung

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Spectral and dynamical aspects of the theory of quasi-periodic Schrödinger operators

19 February to 28 May 2019

Tuesdays, 10:15 - 12:00

HG G 43, ETH Zürich, Rämistrasse 101

Abstract

Lattice Schrödinger operators are of fundamental importance in Solid State Physics. They appear when one wants to model the interaction of an electron with a fixed lattice of positive centers, and their spectral properties determine to a large extent the dynamics (diffusion vs. localization) of this electron. Among them, quasi-periodic Schrödinger operators play a special role and, despite the apparent regularity of their potentials, provide very rich behaviors and challenging problems. The aim of these lectures is to give an introduction to the spectral theory of quasi-periodic Schrödinger operators when the lattice is one-dimensional. I will show how methods from dynamical systems, in particular the theory of quasi-periodic cocycles, are a precious tool to investigate the spectral properties of these operators and conversely how the spectral point of view enriched our understanding of dynamical systems, in particular of non-uniformly hyperbolic ones. One of the central theme of the course will be to explain how spectral notions such as spectrum, spectral measures, the integrated density of states, spectral types... have dynamical counterparts such as (uniform) hyperbolicity, Weyl m-functions, rotation number, reducibility or non-uniform hyperbolicity...

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