SPECTRAL AND SCATTERING THEORY OF DIFFERENTIAL OPERATORS

By

Usama Mohammad Abdelsalam Ahmad

A thesis submitted in partial fulfillment
Of
The requirements for the degree of

Doctor of Philosophy

In

Mathematics
(Functional Analysis)

Department of Mathematics
Faculty of Science, Fayoum

FAYOUM UNIVERSITY

2009

ABSTRACT

We consider the Schrodinger operator H with certain potentials either in the space $L^2(\mathrm{R}^d)$ or $l^2(Z^d)$. Our goal is to study spectral and scatter- ing properties of the operator H with different potentials. The main research relies on : the existence and completeness of wave operators, surface poten- tials, spectral theory and related topics. We discuss some approaches to the scattering problem for a pair of operators H_0 and H, where H is the perturbed operator and H_0 is the unperturbed operator while the potential V is the per- turbation. We study the spectral properties of H with different potentials such as random potentials, sparse potentials, surface potentials, and double-well po- tentials. The task of perturbation theory is to deduce information about the spectral properties of $H = H_0 + V$ from those of H_0. .