Lecture series on
Inverse Scattering Theory
by
Prof. Dr. David Colton
University of Deleware, Newark (USA)

from March 30th to 5th of April, 2005

The course will be organized as follows:

Wednesday,	**30th Mar.**	**10:15 - 11:45**	**Bessel Functions and the Helmholtz equation**
	Exercises	**15:15 – 16:00**	
Thursday,	**31st Mar.**	**10:15 - 11:45**	**The Direct Scattering Problem**
	Exercises	**15:15 - 16:00**	
Friday,	**1st. Apr.**	**10:15 - 11:45**	**Uniqueness Theorems for the Inverse Problem**
	Exercises	**15:15 - 16:00**	
Monday,	**4th. Apr.**	**10:15 - 11:45**	**The Linear Sampling Method – Part I**
	Exercises	**15:15 - 16:00**	
Tuesday,	**5th. Apr.**	**10:15 - 11:45**	**The Linear Sampling Method – Part II**
	Exercises	**15:15 - 16:00**	

A typed manuscript will be available in the library for the stundent's use.

Abstract

The field of inverse scattering theory has been a particularly active field in applied mathematics for the past twenty years. The aim of research in this field has been to not only detect but also to identify unknown objects through the use of acoustic, electromagnetic or elastic waves. Although the success of such techniques as ultrasound and x-ray tomography in medical imaging has been truly spectacular, progress has lagged in other areas of application which are forced to rely on different modalities using limited data in complex environments. Indeed, as one researcher in the problem of mine detection complained, "Target identification is the great unsolved problem. We detect almost everything, we identify nothing".
This lecture series is designed to be a brief introduction to the field of inverse scattering theory, focusing on a simple model problem connected with the scattering of time-harmonic electromagnetic waves by an imperfectly conducting infinite cylinder. We begin with a brief discussion of Bessel functions and Herglotz wave functions, the uniqueness of a solution to the direct scattering problem and the existence of a solution to the direct scattering problem by the method of integral equations. We then consider the inverse problem of determining the shape of the scatterer and the surface impedance on the boundary of the scatterer from a knowledge of the asympotic behavior of the scattered wave. We will show that both of these quantities are uniquely determined and show how the theory of improperly posed problems can be used to provide a reconstruction procedure for their determination.

Attention! The location has changed. The lectures will take place at
HS6 Institut of Mathematics,   Bunsenstraße 3-5

More information about the author: http://www.math.udel.edu/~colton