Introduction to Scattering Theory

Instructor: Prof. Peijun Li, Purdue University (e-mail: `lipeijun@math.purdue.edu`)

Time:

Wednesday	June 2	9 am – 11 am
Friday	June 4	9 am – 11 am
Monday	June 7	9 am – 11 am
Wednesday	June 9	9 am – 11 am
Friday	June 11	9 am – 11 am
Monday	June 14	9 am – 11 am

Office hour:

Thursday	June 3	9 am – 10 am
Thursday	June 10	9 am – 10 am

Prerequisite: Basic knowledge of functional and numerical analysis, and partial differential equations.

Description: Scattering problems are concerned with the effect that an inhomogeneous medium has on an incident field. If the total field is viewed as the sum of an incident field and a scattered field, the direct scattering problem is to determine the scattered field from the incident field and the differential equation governing the wave motion; the inverse scattering problem is to determine the nature of the inhomogeneity, such as location, geometry, or material property, from a knowledge of the scattered field. These problems have played a fundamental role in diverse scientific areas such as radar and sonar (e.g., stealth aircraft design and submarine detection), geophysical exploration (e.g., oil and gas exploration), medical imaging (e.g., breast cancer detection), near-field optical microscopy (e.g., imaging of small scale biological samples), and nano-optics.

The course will provide introductory material to the area in scattering theory that offers rich and challenging mathematical problems. An emphasis of this course is on the formulation of the mathematical models, and the design and analysis of computational approaches.

Text: No textbook is required. Lecture notes will be made available to students.

Course grade: No exams. Course-related readings will be handed out and projects will be assigned.

References

1. D. Colton and R. Kress, *Integral Equation Methods in Scattering Theory*, 1983.
2. D. Colton and R. Kress, *Inverse Acoustic and Electromagnetic Scattering Theory*, 1998.