

MATH 651—Winter 2017
WAVES AND IMAGING IN RANDOM MEDIA

This is a special topics course. The focus is on the theory of wave propagation in inhomogeneous media in various asymptotic regimes including: (i) geometrical optics of high-frequency waves (ii) homogenization of low-frequency waves in periodic and random media (iii) radiative transport and diffusion theory for high-frequency waves in random media. Applications to inverse problems in imaging will be considered. The necessary tools from asymptotic analysis, scattering theory and probability will be developed as needed. The course is meant to be accessible to graduate students in mathematics, physics and engineering.

Prerequisites: basic partial differential equations; some knowledge of probability theory would be useful, but not essential.

Instructor:

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Office hours: immediately after class.

Textbook: *Principles of Scattering and Transport of Light* by Carminati and Schotland. Available on CTools.

Course Outline

Week 1 – wave propagation
Weeks 2,3 – scattering
Weeks 4,5 – homogenization
Weeks 6,7 – radiative transport
Weeks 8,9 – speckle
Weeks 10–12 – applications to imaging

Homework:

Problem sets will be assigned every 3–4 weeks. Students may work together on the problems. However, the solutions must be written up independently.

Final Grade:

Will be determined from an average of the scores on the problem sets.