

## Syllabus for Graduate Course

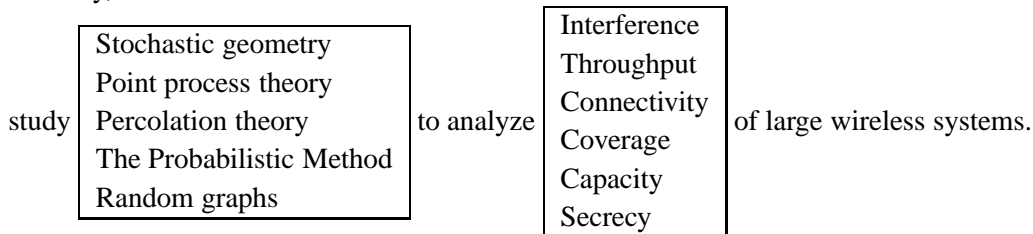
# EE 87021: Advanced Topics in Random Wireless Networks

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August 25, 2010

## 1 Overview

This course provides an introduction to the theory of spatial point processes and random geometric graphs. These mathematical techniques will be applied to the stochastic analysis of large wireless networks. Specifically, we will



Course webpage: <http://www.nd.edu/~mhaenggi/ee87021/>.

## 2 Course Goals

After completing this course, the student should:

- Understand research articles on the stochastic analysis of large wireless systems, for example the ones in the issue on *Stochastic Geometry and Random Graphs for Wireless Networks* of the IEEE Journal on Selected Areas in Communications.
- Have the background needed to conduct original research in that area, using analytical tools and simulation.

## 3 Software: The R Statistical Package

We will be using the Statistical Package R (in addition to Matlab). To download R, go to <http://www.r-project.org/>. Mac users can get the disk image from <http://cran.stat.ucla.edu/bin/macosx/R-2.7.1.dmg>, for example. We will need the spatstat package (and the ones it depends on).

## 4 Reading list (representative but incomplete)

1. A. Baddeley, “Spatial Point Processes and their Applications”. 75 pages.
2. M. Haenggi et al., “Stochastic Geometry and Random Graphs for the Design and Analysis of Wireless Networks. 18 pages.
3. M. Haenggi and R. K. Ganti, “Interference in Large Wireless Networks”. 122 pages.
4. J. Dall and M. Christensen, “Random geometric graphs”. 9 pages.
5. V. Beffara and V. Sidoravicius, “Percolation theory”. 9 pages.
6. I. Glauche et al., “Continuum percolation of wireless ad hoc communication networks”. 24 pages.
7. S. B. Lowen and M. C. Teich, “Power-Law Shot Noise”. 17 pages.
8. J. Ilow and D. Hatzinakos, “Analytic Alpha-Stable Noise Modeling in a Poisson Field of Interferers or Scatterers”.
9. F. Baccelli et al., “An ALOHA Protocol for Multihop Mobile Wireless Networks”.
10. S. Weber et al., “Transmission capacity of Wireless Ad Hoc Networks with Outage Constraints”.

As an introduction of the use of  $\mathbf{R}$  for the analysis of spatial point patterns, please refer to:

A. Baddeley, “Analysing spatial point patterns in  $\mathbf{R}$ ”.

## 5 Tentative Schedule

No class	Make-up class
W Sep. 22	F Sep. 3
W Sep. 29	F Sep. 10
M Nov. 8	F Oct. 8
M Nov. 29	F Oct. 29
M Dec. 6	F Nov. 19
W Dec. 8	F Dec. 3

MW 3-4:15, except:

## 6 Grading

The grade will depend on participation in class, homework, a project, a midterm, and an oral final exam.