The Graduate Center of CUNY

Ph.D. Program in Mathematics

Course Syllabus

Course Title: Topics in Probability Theory

Course #: MATH 83600

Time and Location: Wed. 10:00AM - 12:00PM

Instructor Name: Shirshendu Chatterjee

Contact Information: shirshendu@ccny.cuny.edu

Pre-Requisites: TBA

Office Hours: TBA

Description:

The course will be an introduction to random graphs. We will mostly follow the books
• “Random Graph Dynamics” by Rick Durrett and
• “Random Graphs and Complex Networks. Vol. I” by Remco van der Hofstad.
We'll begin with Branching Process and the story of the Erdos-Renyi random graph. The main focus will be on the phase transition resulting in a giant component. We will then consider other random graph models giving rise to different degree distributions. Examples include the small world model, preferential attachment, and the configuration model. Once we have discussed the geometry of random graphs, we will turn to the study of dynamics taking place on them such as epidemics, random walks, the voter model, first-passage percolation, competition models etc. The emphasis will be on proving theorems, but we will emphasize ideas behind the proofs rather than slugging through all the details. So the course should cater those who want to know what is true rather than why. This course should be a good introduction to the research on complex networks and dynamics on them.