SYLLABUS - EE 511 (FALL 2016)
SIMULATION METHODS FOR STOCHASTIC SYSTEMS

Course Information:

Location: GFS 104 (1500h-1550h/1600-1650h)
Instructor: Dr. Osonde Osoba
Office Hours: F 1700h - 1900h in EEB 420
Email: osonde.osoba@usc.edu (put "EE511" in the subject)

TA: Huo Chen
Email: huochen@usc.edu

Grading: 5 Projects, 20% each

Course Description:

Randomness and uncertainty are an integral part of nature e.g. random variations in weather, human traffic, epidemic spread, stock prices, etc. Stochastic models are important tools for characterizing or modeling such phenomena. The goal of this course is to develop a facility with stochastic simulation and analysis. The course starts with an introduction into tools for generating and validating models of randomness. We will use our introductory discussions of randomness as an excuse to study basic random networks. Then we will discuss methods for unsupervised analysis of data sets including cluster methods and dimensions reduction methods and maximum likelihood fit methods. Then we end by learning to put randomness to work on optimization and estimation applications using Monte Carlo and Markov chain Monte Carlo (MCMC) methods.

Requirements:

A graduate-level maturity in mathematics. Students should either have taken EE503. Students should have some programming experience - preferably in R, Python, or MATLAB. You may also want to consider starting a GitHub repository for solutions and documentation on your class projects.
Your performance on the projects determines your grade.

Course Topics

1) Review of Probability & Randomness
2) Bootstrapping and Resampling methods
3) Random Number Generation methods
4) Statistical Tests for validating probabilistic models
5) Clustering & Dimension Reduction
6) Expectation Maximization Algorithms
7) Monte Carlo Methods, Variance Reduction techniques
8) Background on Markov chain
9) Markov Chain Monte Carlo methods