

SYLLABUS - EE 511 (SPRING 2018)

SIMULATION METHODS FOR STOCHASTIC SYSTEMS

Course Information:

Location: GFS 101 (1800h-1850h)

Instructor: Dr. Osonde Osoba

Office Hours: F 1700h - 1750h in EEB 420

Email: osonde.osoba@usc.edu (put "EE511" in the subject)

Grader/TA: TBD

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 such random phenomena. The goal of this course is to develop a facility with working with a couple of models for stochastic simulation and analysis. The course starts with an introduction into tools for generating and validating models of randomness. We take a look at maximum likelihood methods for characterizing and clustering random data. 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 MATLAB, Python, or R. You may want to consider starting a GitHub repository for your code solutions. Your performance on the projects determines your grade.

Text & References:

- *Simulation* (5th Ed.), Sheldon Ross, Academic Press
- Selected papers and class notes on Blackboard

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, & Expectation-Maximization
- 6) Monte Carlo Methods, Variance Reduction techniques
- 7) Background on Markov chain
- 8) Markov Chain Monte Carlo methods