Syllabus

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Syllabus
Spring 2014

Course: MSCS 6020 Simulation
Time: TuTh 5:00-6:15 Cudahy Hall 120
Instructor: Daniel B. Rowe, Ph.D.
Course Description From The University Bulletin

MSCS 6020. Simulation. 3 cr. hrs.
Office Hours: TuTh 4:00-5:00 pm
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ISBN: 0124159710

Grading: A midterm (in class) on March 6, weekly homework & class participation, and a final exam (possibly in class) on May 6, 5:45 pm – 7:45 pm.
Homework & Participation (30%), Mid-Term (30%), Final (40%).
Chapter 2: Elements of Probability
   Sample Space and Events, Axioms of Probability, Random Variables, Expectation, Discrete RVs, Continuous RVs, Conditional Expectation and Variance

Chapter 3: Random Numbers
   Number Generation, Random Numbers to Evaluate Integrals

Chapter 4: Generating Discrete RVs
   Inverse Transform, Poisson RV, Binomial RV, Acceptance-Rejection, Composition Approach, Alias Method, Random Vectors
Chapter 5: Generating Continuous RVs

Chapter 6: Multivariate Normal and Copulas
Multivariate Normal, Generating Multivariate Normal RVs, Copulas, Generating Variables from Copula Models

Chapter 7: Discrete Event Simulation
Discrete Events, Queueing Systems, Inventory Model, Insurance Risk Model, Repair Problem, Stock Option
Chapter 8: Analysis of Simulated Data
Sample Mean and Variance, Interval Estimates of Mean, Bootstrapping for Mean Square Error

Chapter 9: Variance Reduction Techniques
Antithetic Variables, Control Variates, Variance Reduction by Conditioning, Stratified Sampling, Importance Sampling, Common Random Numbers, Exotic Option

Chapter 10: Additional Variance Reduction Techniques
Conditional Bernoulli Sampling, Normalized Importance Sampling, Latin Hyper Cube Sampling
Chapter 11: Statistical Validation Techniques

Goodness of Fit Tests, Two Sample Problem, Validating Assumptions of a Nonhomogeneous Poisson Process

Chapter 12: Markov Chain Monte Carlo Methods

Markov Chains, Hastings-Metropolis Algorithm, Gibbs Sampler, Markov Chains and Queueing Loss, Simulated Annealing, Sampling Importance Resampling

D.B. Rowe
Numerical Flavor

All slides are a summary of the material and do not contain all detail. Book is ultimate authority.

Familiarize yourself with Matlab