Department of Mathematics, Statistics, and Computer Science
Marquette University
Syllabus

Course: MSCS 6020 Simulation, Spring 2015
Time: TuTh 6:30-7:45 Cudahy Hall 126
Instructor: Daniel B. Rowe, Ph.D.
Office Hours: TuTh 5:30 pm – 6:30 pm
Office: CU 313
E-mail: daniel.rowe@marquette.edu

Texts: Ross, Sheldon (2012). *Simulation*, Fifth edition, Academic Press. ISBN: 0124159710
Grading: A midterm (in-class and take-home portions) on March 5, weekly or biweekly homework and participation, and a final exam (in class and take-home portions) on Dec 5, 8:00 pm – 10:00 pm. Homework & Class Participation (30%), Mid-Term Exam (30%) ,and a 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
Inverse Transform, Rejection Polar Method for Normal RVs, Poisson Processes, Nonhomogeneous Poisson Processes, 2D Poisson Process.
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