1. **Introduction** (Bank & Carson chapters 1 and 2)
   - Ways to Study a System
   - What is Simulation?
   - Modeling and Simulation
   - Simulation Model
   - Discrete-Event Simulation
   - Example: Simulation of Queuing Systems
   - Summary

2. **Principles of Modeling and Simulation** (Bank & Carson chapter 3.1)
   - Concepts in Discrete-Event Simulation
   - How do we Advance Simulated Time?
     - fixed-increment time advance
     - next-event time advance
   - How to Model Events in Simulated Time?
   - Modeling World Views
     - event-scheduling approach
     - process interaction approach
   - Summary

3. **Components & Organization of Discrete-Event Simulation** (Bank & Carson chapter 4.4)
   - Components and Organization
   - Example of a Single Server Queue
     - Problem Statement
     - Variables, Functions and Subroutines
     - Overall Structure in Java
     - Java Simulator Program
   - Summary

4. **Simulation Algorithms & Software** (Bank & Carson chapter 3.2, 4.1, 4.7)
   - Serial DES Algorithms
   - Parallel & Distributed Simulation
   - Classification of Simulation Software
   - Selection of Simulation Software
   - Composable Simulation
   - Summary

5. **Statistical Models in Simulation** (Bank & Carson chapter 5)
   - Purpose
   - Review of Terminology and Concepts
   - Common (parametric) Distributions
     - discrete distributions
     - continuous distributions
   - Poisson distribution
- Empirical distributions
- Summary

6. **Random Number Generation** (Bank & Carson chapter 7)
   - Purpose
   - Properties of Random Numbers
   - Techniques for Generating Random Numbers
     - Linear congruential method
     - Combined linear congruential generators
     - Random-number streams
   - Tests for Random Numbers
     - Frequency tests
     - Autocorrelation test
   - Summary

7. **Random Variate Generation** (Bank & Carson chapter 8)
   - Purpose and Overview
   - Techniques
     - Inverse transform
     - Acceptance rejection
     - Special
   - Summary

8. **Input Data Modeling** (Bank & Carson chapter 9.1 to 9.6)
   - Purpose and overview
   - Four steps
     - Collecting raw data
     - Identifying the distribution
     - Estimating the parameters
     - Testing for goodness-of-fit
   - Modeling in the Absence of Data
   - Some Rules of Thumb
   - Summary

9. **Simulation Model Verification & Validation** (Bank & Carson chapter 10)
   - Purpose and overview
   - Verification
   - Calibration and Validation
     - Face Validity
     - Validation of Model Assumptions
     - Validating Input-Output Transformations
   - Summary

10. **Output Analysis** (Bank & Carson chapter 11)
    - Introduction
    - Purpose and problems
    - Statistical analysis
    - Types of simulation
- Terminating simulation
  - Analysis of transient simulations
- Non-terminating simulation
  - Ways of gathering independent observations
  - Analysis of steady-state simulations
- Summary

11. Comparison and Evaluation of Alternative System Designs (Bank & Carson 12.1, 12.2, 12.4)
- Purpose
- Two-system comparisons:
  - Independent sampling
  - Correlated sampling (common random numbers)
- Multiple system comparisons:
  - Bonferroni approach: confidence-interval estimation, selecting the best and screening
  - Optimization via simulation – robust heuristics and control sampling variability
- Summary

12. Experimental Designs Overview
- Purpose
- Terminology
- Types of Experimental Designs
  - Simple Design
  - Full Factorial Design
  - Fractional Factorial Design
- Multiple Measures of Performance and Multiple Decision Variables
- Further Reading

13. Case Study – Comparison of Load Balancing Strategies on Cluster-based Web Servers
- Introduction
- System Modeling
- Simulation Implementation
- Workload Generation
- Simulation Model Validation
- Experiment Results and Analysis
- Summary

14. Conclusions and Revision

Readings


The Life Cycle of a Simulation Study