

EE/CpE 345 Modeling and Simulation Syllabus

1. Introduction

- a. Course Logistics
- b. Definitions of Modeling and Simulation
- c. When to apply these techniques
- d. Applications
- e. Terminology & Components
- f. Discrete vs. Continuous time
- g. Process flow in simulation study

2. Simulation Examples

- a. Queuing systems
- b. Communications networks

3. General Principles

- a. Event-driven simulation
- b. World Views
- c. List processing

4. Simulation software

- a. History
- b. Selection process
- c. Simulation in High Level Language (C, C++, Pascal, Fortran)
- d. Simulation packages (Matlab/Simulink)
- e. Interpreted vs. compiled simulators
- f. Future trends

5. Statistical models

- a. Terminology and Concepts
- b. Useful Statistical Models
- c. Distributions

6. Queuing models

- a. Characteristics
- b. Performance Measures
- c. Steady-State Behavior
- d. Networks of Queues

7. Random Number Generation

- a. Properties of Random Numbers
- b. Generation of Pseudo-Random Numbers
- c. Testing for Randomness
- d. Pitfalls

8. Random Variate Generation

- a. Inverse Transform
- b. Direct Transform
- c. Convolution
- d. Accept-Reject

9. Input Modeling

- a. Collecting Data

- b. Identifying Distribution
- c. Histograms
- d. Parameter Estimation
- e. Goodness-of-Fit
- f. Selecting Input Model without Data

10. Verification and Validation of Simulation Models

- a. Model Building, Verification, and Validation
- b. Verification of Simulation Models
- c. Calibration and Validation of Models

11. Output Analysis

- a. Types of Simulations with Respect to Output Analysis
- b. Stochastic Nature of Output Data
- c. Measures of Performance
- d. Output Analysis for Termination Simulations
- e. Output Analysis for Steady-State Simulations

12. Advanced Topics and Course Summary