

## IE 510 – Simulation Modeling Spring 2007

**Instructor:** Wolfgang Hörmann

**Referencebooks:** A.M Law and W.D. Kelton: Simulation Modeling and Analysis  
Hörmann, Leydold, Derflinger: Automatic Nonuniform Random Variate Generation

Devroye: Non-Uniform Random Variate Generation

**Goals:** To provide a basic treatment of important aspects of discrete event simulation. To lead the students to the ability to design, implement and run simple to intermediate simulation problems using the “R” software and to use variance reduction techniques for practical simulation applications.

Examples from discrete Event Simulation (e.g. inventory systems) and MonteCarlo integration (e.g. financial simulation) will be discussed.

### Prerequisites:

1. Good knowledge of probability and statistics
2. Knowledge of a programming language is an advantage

### Topics:

1. Two to three weeks of
  - A) Implementing simple simulation models in R.
  - B) “Simulation in action” for the simple models developed in A.
  - C) A very short primer on modeling, validation and output analysis.
2. Simulation for inventory systems. (1 week)
3. Monte Carlo Simulation for finance. (3 weeks)
4. Variance reduction techniques applied to the simulations of 2 and 3. (3 weeks)
  - a) Common random numbers,
  - b) Anthitetic variates
  - c) Controll variates
  - d) Importance sampling
5. Quasi Monte Carlo Approach

**Computer Usage:** In a final project all students have to design, implement and test their own simulation models.

**Grading:** Midtermtest (~35 %) (probably in the end of April), Final Project(35~%), Assignments (~25%) and Attendance (~10%).