Syllabus

Course

Code: *CSC 424*

Title: *Modeling and Simulation*

Credits

3-0-0-3

Text Books

- Volker Grimm, Steven F. Railsback. **Individual-based Modeling and Ecology.** Princeton University Press, 2005, ISBN: 069109666X, 480 pages

References

- Jerry Banks, John Carson, Barry L. Nelson, David Nicol. **Discrete-Event System Simulation** (4rd edition), Prentice Hall, 2005, ISBN: 0131446797, 624 pages

Prerequisite:

STAT 311

Course Description

Introduction to modeling and simulation concepts. System analysis and classification. Abstract and simulation models. Continuous, discrete, and combined models. Heterogeneous models. Using Petri nets and finite automata in simulation. Pseudorandom number generation and testing. Queuing systems. Monte Carlo method. Continuous simulation, numerical methods, Modeling language. Simulation experiment control. Visualization and analysis of simulation results.

Objectives:

- Learn the theory of computer simulation and modeling.
- Learn and be able to model phenomena using discrete and continuous probability distributions, and elements from queuing theory.
- Learn the techniques of pseudo-random number generation.

- Learn the design of a computer simulation, conduct input modeling, verification, validation, and output analysis.
- Apply knowledge and skills learned on at least one large collaborative modeling and simulation project.

Course Outline

Week	Topic
2	Introduction to computer simulation and modeling, role in engineering design and scientific discovery, types of simulations, general principles, software
2	Mathematical and statistical models, discrete distributions, continuous distributions, Poisson processes, empirical distributions
2	Random number generation, types of pseudo-random number generators, tests of random number generators
2	Random variant generation
2	Input modeling, simulation design, experimental design
2	Verification and validation
2	Output analysis, interpretation of results, visualization
1	Special topics

Grading

Assessment/Evaluation:

1. Quizzes (5)   (10%)
2. Assignment (2)   (20%)
3. Midterm-1 Exam.   (15%)
4. Midterm-2 Exam.   (15%)
5. Final Exam.   (40%)
   Total   **(100%)**

Method of Teaching:

- Lectures - 15 weeks (3 hrs per week).
- Individual exercises and homeworks.
- In-class discussion
- Selection of Readings
- Tutorials