Course Code: BBIT 401
Course Title: SIMULATION AND MODELING
(Pre requisite: BUSS 202: Probability and Statistics)

Course Purpose

This course provides an introduction to system modeling using both computer simulation and mathematical techniques. A wide range of case studies are examined, both in the lectures and tutorial exercises.

Expected Learning Outcomes

At the end of the course, students will be able to:

1. Understand the system modeling through the competent use of computer simulation methods in mathematical modeling techniques.
2. Apply the fundamental laws of performance analysis to establish the relationships between workload parameters and system performance for a given system.
3. Analyze system responsiveness, scalability etc. as a function of workload.

Course Contents

Introduction and basic simulation procedures, model classification, Monte Carlo simulation, discrete-event simulation, continuous system simulation, mixed continuous/discrete-event simulation, queuing networks, analytical and simulation modeling of queuing systems, input and output analysis, random numbers, generating and analyzing random numbers, sample generation, place and execution driven simulation point and internal estimation, process-oriented and parallel simulation, modeling principles, fundamental laws, Monte Carlo simulation, stochastic state transition systems, Discrete-event simulation (DES), principles of DES, formalization as a generalized semi-Markov Processes (GSMPs), random number generation, distribution sampling, analysis of simulation output, Markov Processes (MPs), numerical solution of MPs, analytical solution of MPs, high-level formalisms, tools and techniques, Stochastic Petri Nets (SPNs) and Stochastic Process Algebras (SPAs), generation of the underlying MP, queuing networks;

Teaching Methodology

- Class lectures that involve proper explanation various simulation models.
- Tutorials that entail solving of problems by both students and lecturer.
- Practical sessions in the lab and practical demonstrations.
- Case studies to model real business situations
- Regular CATs and assignments that are discussed after grading.

Instructional Materials/Equipment
Class with visual aids, Computers

Course Assessment/Student Performance
Continuous Assessment: 40%
Examination: 60%
(Grading as detailed under examination regulations)

Recommended Readings

1. Law,AM. & Kelton, WD.2000. *Simulation Modeling and Analysis*.3rd edition. Boston: McGraw Hill.
2. Birta, LG, Arbez, G.2007. *Modeling and Simulation*. Springer.
3. Kelton, WD, Sadowski,RP and Sturrock.,DT. *Simulation with Arena*. 3rd edition. Boston: McGraw-Hill Higher Education.
4. Banks, J. Carson,JS and Nelson, BJ. *Discrete -Event System Simulation*.2nd edition. New Jersey: Prentice Hall.
5. Ross, Sheldon M.2006. *Simulation*. Amsterdam: Elsevier Academic Press

A list of journal databases provided at the http://www.kca.ac.ke/index.php/electronic-resources-left-menu-175