King Saud University

College of Computer and Information Sciences

Department of Computer Engineering

1. Course number and name: **CEN 401, Queueing Theory and Simulation**

2. Credits and contact hours: **3 (3, 0, 1)**

3. Instructor's or course coordinator's name: Nassereddine Rikli

4. Text book, title, author, and year:

Probability and Random Processes for Electrical Engineering, Alberto Leon-Garcia, 3rd Edition, 2008.

Discrete event system simulation, *J*. Banks, J. Carson, B. Nelson and David Nicol, 5th Edition, 2010.

a. other supplemental materials:

Probability, Random Variables, and Stochastic Processes, Papoulis and Pillai, McGraw Hill, 2002.

System Simulation with Digital Computer, Narsingh Deo, Prentice Hall, 1983.

5. Specific course information

a. Course description (catalog)

Probability theory: random variables, transformation of random variable. Probability density functions. Markov chains: stochastic processes, Poisson and Exponential processes. Queuing Systems: Little's theorem, M/M/1, M/M/1/K, and M/G/1.

Computer simulation: random number generators, validation tests, generating random variables, event-driven simulation. Simulation languages and software simulation.

b. prerequisites or co-requisites: CEN343 (prerequisite).

c. Required, elective, or selected elective course: Elective.

6. Specific goals for the course

a. Course Learning Outcomes: This course requires the student to demonstrate the following

1. Describe real life phenomena through standard distribution functions.
2. Characterize phenomena which evolve with respect to time in a probabilistic manner.
3. Acquire skills in characterizing features of a queuing system and analyzing queuing models.
4. Establish a strong foundation on concepts of computer simulation and mathematical modeling.
5. Recognize the techniques of random number generation and randomness testing.
6. Design simulation models for various case studies like traffic flow in networks.
7. Apply simulation tools and impart knowledge on building simulation systems.

b. Relationship of Course to Student Outcomes

Outcome	Student Outcome Description	Contribution
(a)	an ability to apply knowledge of mathematics, science, and engineering	√
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify, formulate, and solve engineering problems	√
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	√
(i)	a recognition of the need for, and an ability to engage in life-long learning	
(j)	a knowledge of contemporary issues	√
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	√

7. Brief list of topics to be covered and schedule in weeks

Review of probability theory	2
Stochastic processes: Poisson and Exponential processes.	3
Queuing Systems: Little's theorem, M/M/1, M/M/k, M/M/∞, M/M/1/k.	2
M/G/1: Pollaczek – Khintchine formula.	1
Generation of random numbers and variates, and validation tests.	2
Input modelling.	1
Event-driven simulation: simulation of M/M/1 queue.	2
Simulation languages	1
Review and evaluation	1

8. Assessment Plan for the Course

Homework/Quizzes	15%
Midterm Exam 1	15%
Midterm Exam 2	15%
Projects	15%
Final Exam	40%
Total	**100%**

Midterm exam dates:

Midterm 1: Saturday, 31 October 2015.

Midterm 1: Tuesday, 1 December 2015.

Course Policies:

- Cheating or plagiarism in any form will not be tolerated. A grade of zero will be registered for any infraction.
  - **Attendance in the lecture is a must.** Students failed to achieve more than 75% attendance will be reported to the concerned authority; excuse should be directly submitted to the concerned authority; excuses of absence are accepted no later than one week of the absence.

Current Instructors, Department, Office Hours and Date:

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