University of Computer Studies
B.C.Sc. / B.C.Tech. (Fifth Year)

CST-501

COURSE DESCRIPTION

Course code number	**CST-501**	**Course Title**	**Mathematics of Computing V**
Semester hours	4 hours	**No. of Credit Units**	3
		Course Coordinator	

Course Description

CST-501. **Mathematics of Computing V**

First part of this course, Markov Chains**,** covers stochastic process, Markov chains, Chapman-Kolmogorov equation, classification of states of a Markov chains, long-run properties of Markov chains, first passage times, absorbing states, continuous time Markov chains.

Second part of this course, covers basics structure of queueing models, examples of real queueing systems, the role of the exponential distribution, the birth and death process, queueing models based on the birth and death process.

Last part of this course covers introduction to simulation, concepts in discrete-event simulation (DES), components of DES, random number generation and performing simulation.

Course Outcomes

The students who succeed the course, Markov Chains, will be able to:
1. Understand and apply Markov Chain to describe real problems,
2. Able to evaluate the steady-state performances, and
3. Understand the analysis techniques for studying Markov chains.

The students who succeed Queueing Theory course will be able to:

1. Understand the terminology and nomenclature appropriate to queueing theory
2. Demonstrate knowledge and understanding of various queueing models
3. Formulate concrete problems using queueing theoretical approaches

After completion of simulation course, students course will be able to understand basic concepts involved in computer simulation of systems and able to learn and practice the overall process of simulation models.

Assessment Plan for the Course

Class Attendance and Participation	-	10%
Quizzes	-	10%
Assignment	-	10 %
Test	-	10%
Final Exam	-	60%

Class Attendance and Participation Policy:

- **Attendance**

Class attendance is **mandatory**. Most of the material you will learn will be covered in the lectures, so it is important that you not miss any of them. You are expected to show up on time for class, and stay for the whole lecture. Students are expected to attend each class, to complete any required preparatory work (including assigned reading) and to participate actively in lectures, discussions and exercises.

• Mobile phones **must** be silenced and put away for the entire lecture unless use is specified by the instructor. You may not make or receive calls on your cell phone, or send or receive text messages during lectures.

• You are responsible for all material sent as email. Ignorance of such material is no excuse. You are responsible for all materials presented in the lectures.

• Your conduct in class should be conducive towards a positive learning environment for your class mates as well as yourself.

- **Quizzes, assignments, tests and Exam**

Your performance in this class will be evaluated using your scores for attendance, quizzes, homework assignments, two tests and one final examination. There are no planned extra credit projects or assignments to improve your grade.

We will take a short quiz for every lecture.

There will be 12 homework assignments, roughly one per week. Please show all your work and write or type your assignments neatly. Credit cannot be given for answers without work (except on true-false, always-sometimes-never, or other multiple choice questions).

Test will start after two or three chapters finished and the coordinator will announce the date for the test.

Any assignment or quiz or test is simply missed, regardless of the reason why (e.g. illness, work, traffic, car trouble, computer problems, death, etc.), and **earns a grade of zero**. You are strongly encouraged to complete all assignments and attend all quizzes so that you can check that you understand the material and can throw out bad grades, or grades for which you

had to miss an assignment or quiz for a valid reason. **Late submissions will not be accepted for any graded activity for any reason.**

- **There are no extra credit opportunities.**

Students may not do additional work nor resubmit any graded activity to raise a final grade.

- **Exam**

The exam will be conducted on-campus, in a classroom. The dates/times/locations will be posted on Board as soon as possible.

For this course, the following additional requirements are specified:

All work submitted for a grade must have been prepared by the individual student. Students are expressly prohibited from sharing any work that has been or will be submitted for a grade, in progress or completed, for this course in any manner with a person other than the instructor and teaching assistant(s) assigned to this course). Specifically, students may not do the following, including but not limited to:

- Discuss questions, example problems, or example work with another person that leads to a similar solution to work submitted for a grade.
- Give to, show, or receive from another person (intentionally, or accidentally because the work was not protected) a partial, completed, or graded solution.
- Ask another person about the completion or correctness of an assignment.
- Post questions or a partial, completed, or graded solution electronically (e.g. a Web site).
- All work must be newly created by the individual student for this course. Any usage of work developed for another course, or for this course in a prior semester, is strictly prohibited without prior approval from the instructor.
- Posting or sharing course content (e.g. instructor provided lecture notes, assignment directions, assignment questions, or anything not created solely by the student), using any non-electronic or electronic medium (e.g. web site, FTP site, any location where it is accessible to someone other than the individual student, instructor and/or teaching assistant(s)) constitutes copyright infringement and is strictly prohibited without prior approval from the instructor.

University of Computer Studies
B.C.Sc. / B.C.Tech. (Fifth Year)

Tentative Lesson

No	Topics	Week	Remark
I	**Chapter 16 - Markov Chains**		
1	16.1 Stochastic Process	Week 1	
2	16.2 Markov Chains		Assignment 1
3	16.3 Chapman-Kolmogorov Equation	Week 2	
4	16.4 Classification of States of a MarkovChains		Assignment 2
5	16.5 Long-Run Properties of Markov Chains	Week 3	Assignment 3
6	16.6 First Passage Times	Week 4	
7	16.7 Absorbing States		Assignment 4
8	16.8 Continuous Time Markov Chains	Week 5	
9	**Test I**		
II	**Chapter 17 - Queueing Theory**		
10	17.1 Prototype Example	Week 6	
11	17.2 Basics Structure of Queueing Models		Assignment 5
12	17.3 Examples of Real Queueing Systems	Week 7-9	Assignment 6
13	17.4 The Role of the Exponential Distribution		Assignment 7
14	17.5 The Birth and Death Process	Week 10-12	Assignment 8
15	17.6 Queueing Models Based on the Birth and Death Process		Assignment 9
16	**Test II**		
III	**Chapter 22 - Simulation**		
17	22.1 Essence of Simulation	Week 13	Assignment 10
18	22.2 Some common types of applications of simulation	Week 14	
19	22.3 Generation of Random Numbers		Assignment 11
20	22.4 Generation of Random Observations from A Probability Distribution	Week 15	
21	22.5 Outline of A Major Simulation Study		
22	22.6 Performing Simulations on SpreadsheetsProblems		Assignment 12
23	Revision		
	Final Exam		