

**City University of Hong Kong
Course Syllabus**

**offered by Department of Management Sciences
with effect from Semester A 2023 / 2024**

Part I Course Overview

Course Title: Probability and Markov Chain Models

Course Code: MS8944

Course Duration: One Semester

Credit Units: 3

Level: R8

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) Nil

Precursors:
(Course Code and Title) Nil

Equivalent Courses:
(Course Code and Title) Nil

Exclusive Courses:
(Course Code and Title) Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

To introduce PhD students to the fundamental knowledge of stochastic modelling and processes with focus on Markov chains, renewal theory, and queuing systems, elements of stochastic simulation, and applications to probability models in operations management.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Familiar with the basic definitions in stochastic modelling and processes		✓		
2.	Understand and prove key results in stochastic processes			✓	
3.	Be able to analyze basic stochastic systems			✓	
...	Be able to apply the theory to operations management related applications				✓
* If weighting is assigned to CILOs, they should add up to 100%.		100%			

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4			
Interactive lecture	Basics of the topics will be covered in a typical lecture setting.	✓	✓	✓	✓			3 hours/week
Tutorials	Assignments will be provided for students to explore the concepts in further detail.	✓	✓	✓	✓			1 hour/week

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4			
Continuous Assessment: 60 %							
Tutorial assignments	✓	✓	✓			30%	
Mid-term test	✓	✓	✓			30%	
Examination: 40 % (duration: 2 hours, if applicable)							
Examination	✓	✓	✓			40%	
						100%	

** The weightings should add up to 100%.*

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Tutorial assignments	ABILITY to APPLY the methodology and knowledge to solve problems	High	Significant	Moderate	Not even reaching marginal levels
2. Mid-term test	EVIDENCE of knowledge of subject matter and capability to formulate, analyze the fundamental probability models and their applications	High	Significant	Moderate	Not even reaching marginal levels
3. Examination	EVIDENCE of knowledge of subject matter and capability to formulate, analyze the fundamental probability models and their applications	High	Significant	Moderate	Not even reaching marginal levels
...					

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Tutorial assignments	ABILITY to APPLY the methodology and knowledge to solve problems	High	Significant	Moderate	Basic	Not even reaching marginal levels

2. Mid-term test	EVIDENCE of knowledge of subject matter and capability to formulate, analyze the fundamental probability models and their applications	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	EVIDENCE of knowledge of subject matter and capability to formulate, analyze the fundamental probability models and their applications	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- Random variables, expectation, moment generating functions, limit theorem, conditional probability, conditional expectation
- Markov chains, Poisson process, birth-death process, uniformization
- Renewal reward processes,
- Queuing theory: networks of queues, M/M/1, M/G/1, M/M/k queues
- Simulation
- Other applications in operations management

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Introduction to Probability Models, Academic Press, Tenth Edition Author: Sheldon M. Ross ISBN-10: 0123756863 ISBN-13: 978-0123756862
2.	Modeling and Analysis of Stochastic Systems. Chapman & Hall, 2020. 3rd Edition (Author: Vidyadhar G. Kulkarni). ISBN 9780367736798

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

Nil.