

Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): MATH 3660 OPERATIONS RESEARCH II (3,3,0)

Course Aims: This course aims to introduce students to some fundamental and advanced topics in operations research. Students will learn theory, techniques, and applications of integer programming, queuing theory, Markov decision process, and nonlinear programming.

Prerequisite: MATH1120

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Learning Outcomes (LOs):

Upon successful completion of this course, students should be:

No.	Learning Outcomes (LOs)
	Knowledge
1	Able to understand the mathematical theory of integer programming
2	Able to understand the solution techniques of integer programming
3	Able to understand the modeling techniques of queuing theory
4	Able to understand the modeling techniques of Markov decision process
5	Able to understand the mathematical theory of nonlinear programming
6	Able to understand the solution techniques of nonlinear programming
	Skills
7	Able to apply the mathematical theory and modeling techniques to design operations research models
8	Able to manipulate the programming to solve operations research problems
	Attitudes
9	Able to identify some operations research problems
10	Able to solve some operations research problems independently

Assessment:

No.	Assessment Methods	Weighting	Remarks
1	Continuous Assessment (assignments, midterm test)	40%	Assignments are designed to measure students understanding of the theory, techniques, applications of integer programming, queuing theory, Markov decision process, queuing theory, and nonlinear programming. The midterm test is conducted to measure students' understanding of some course materials in a timely manner.
2	Final Examination	60%	The final examination is designed to see how far students have achieved their intended learning outcomes especially in the knowledge domain. Students should have a thorough understanding of the knowledge and apply them correctly in both depth and width in order to perform well in the final exam.

Learning Outcomes and Weighting:

Content	LO No.	Teaching (in hours)
I. Integer Programming	1,2,7,8,9,10	9
II. Queuing Theory	3,7,8,9,10	9
III. Markov Decision Process	4,7,8,9,10	8
IV. Inventory Control	5,6,7,8,9,10	16

Textbook: F.S. Hillier and G.J. Lieberman, Introduction to Operations Research, 9th Ed., McGraw-Hill, 2010.

References: H.A. Taha, Operations Research, an Introduction, 6th Ed., Prentice Hall, 2003.

W. Winston, Operations Research: Applications and Algorithms, 4th Ed., 2004.

Course Content in Outline:

	<u>Topic</u>	Hours
I.	Integer Programming	9
	A. Integer programming models	
	B. Branch and bound algorithm	
	C. Cutting plane algorithms	
II.	Queuing Theory	9
	A. Basic queuing problems	
	B. Birth and death process	
	C. Finite queuing models	
	D. Advanced queuing models	
III.	Markov Decision Process	8
	A. Markov chains	
	B. Finite-stage Markov decision models	
	C. Infinite-stage Markov decision models	
	D. Computational algorithms	
IV.	Nonlinear Programming	16
	A. The Kuhn-Tucker conditions	
	B. Quadratic Programming	
	C. Convex Programming	
	D. SUMT (Sequential Unconstrained Minimization Technique)	