City University of Hong Kong
Course Syllabus

offered by College/School/Department of _Mathematics_____
with effect from Semester __B____ 20_17_ / _18_

Part I Course Overview

Course Title:	**Introduction to Optimization**
Course Code:	**MA3515**
Course Duration:	**One semester**
Credit Units:	**3**
Level:	**B3**
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites: *(Course Code and Title)*	**MA2503 Linear Algebra**
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)

This course introduces basic concepts and methods of optimization. It emphasizes equally all three aspects of understanding, algorithms and applications. It also equips students with computing techniques and ability of applying taught methods to solve practical problems.

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.	explain clearly basic concepts of linear and non-linear programming.	10%	Y		
2.	solve problems of linear programming, integer programming and non-linear programming with fundamental methods in optimization.	20%	Y	Y	
3.	apply linear programming tools to solve two-person zero-sum games.	20%	Y	Y	
4.	apply mathematical and computational methods of optimization in formulating and solving real-life problems.	20%		Y	Y
5.	the combination of CILOs 1-4	30%	Y	Y	Y
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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	5		
Lecture	Learning through **teaching** is primarily based on lectures.	Y	Y	Y	Y	Y		39 hours in total
Take-home assignments	Learning through **take-home assignments** helps students understand techniques of basic methods in linear, integer and	Y	Y	Y	Y			after-class

	non-linear programming as well as their applications in solving optimization problems.							
Projects	Learning through **project(s)** helps students apply mathematical and computational methods of optimization in formulating and solving more sophisticated real-life problems on linear/integer/non-linear programming. It also helps students to communicate and collaborate effectively in the team.			Y	Y			
Online applications	Learning through **online examples for applications** helps students create and formulate mathematical models and apply to a range of practical problems in economics/science.				Y			after-class
Math Help Centre	Learning activities in **Math Help Centre** provides students extra help.	Y	Y		Y			after-class

4. Assessment Tasks/Activities (ATs)

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

30% Coursework

70% Examination (Duration: 3 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4	5			
Continuous Assessment: _30___%								
Test	Y	Y		Y			15-30%	Questions are designed for the part of the course to see how well the students have learned basic concepts of methods in linear programming and recognized their applications in solving

								optimization problems.
Hand-in assignments	Y	Y	Y	Y			0-15%	These are skills based assessment to enable students to demonstrate techniques of applying optimization methods in a diversity of problems.
Project(s)			Y	Y			0-15%	Students are assessed on their ability in applying mathematical and computational methods to solve real-life optimization problems, as well as on the presentation of solutions with analysis.
Formative take-home assignments	Y	Y	Y	Y			0%	The assignments provide students chances to demonstrate their achievements on techniques of optimization learned in this course.
Examination: _70___% (duration: 3 hrs, if applicable)								Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills and understanding based to assess the student's versatility in basic methods of mathematical programming.
** The weightings should add up to 100%.*							100%	

5. Assessment Rubrics

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

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test	Ability to understand the basic concepts of methods in linear programming and recognize their applications in solving optimization problems	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	Ability to apply the techniques of optimization methods in a diversity of problems	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Projects	Ability to apply mathematical and computational methods to solve real-life optimization problems and present the solutions with analysis					
4. Examination	Ability to solve linear and non-linear programming problems with fundamental methods in optimization.	High	Significant	Moderate	Basic	Not even reaching marginal levels
5. Formative take-home assignments	Ability to demonstrate students' achievements on techniques of optimization learned in this course	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.)

Examples of Optimization Problems. Simplex Method for Linear Programming Problems. Duality Theory of Linear Optimization. Sensitivity Analysis for Linear Programming Problems, Cutting Plane Methods for Integer Programming Problems, Two-person Zero-sum Games, The Fundamental Theorem and Computational Techniques.

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.	Text(s): Paul R. Thie, "An Introduction to Linear Programming and Game Theory", John Wiley & Sons, 1988.
2.	
3.	
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2.2 Additional Readings

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

1.	
2.	
3.	
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