Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): **MATH7050 OPTIMIZATON THEORY AND TECHNIQUES (3,3,0)**

Syllabus Proposed by: L.Z. Liao

Pre-requisite: Postgraduate standing or Consent of the instructor

Objectives: This course is focused on the following three aspects:
a) provide the fundamental theory and techniques in unconstrained and constrained optimization;
b) introduce some existing numerical software packages; and
c) offer some interdisciplinary techniques and applications related to optimization.

Calendar Description: This course introduces the fundamental theory and techniques for both unconstrained and constrained optimization. Overview of the existing numerical software packages will be addressed. Finally some interdisciplinary techniques and applications related to optimization will be discussed.

References:
D.G. Luenberger, Linear and Nonlinear Programming, 2nd Ed., Addison-Wesley, 1984.
P.E. Gill, W. Murray, M.H. Wright, Practical Optimization, Academic Press, 1981.
R. Fletcher, Practical Methods of Optimization, 2nd Ed., John Wiley & Sons, 1987.
J.E. Dennis, Jr., R.B. Schnabel, Numerical Methods for Unconstrained Optimization and Nonlinear Equations, SIAM, 1996.

Software : Matlab

Assessment: Continuous Assessments & a mini-project (40%)
Final Examination (60%)

Remark: If this course is offered together with MATH3850, more difficult questions will be required for postgraduate students in both assignments and examinations.

Course Content in Outline:

	Topic	Hours
I.	Fundamentals	4
	A. Multivariable Calculus Background	
	B. Numerical Linear Algebra Background	
II.	Optimality Conditions	4
	A. Unconstrained Optimization	
	B. Linearly Constrained Optimization	
	C. Nonlinearly Constrained Optimization	
III.	Unconstrained Methods	14
	A. Second Derivative Methods	
	B. First Derivative Methods	
	C. Derivative-free Methods	
IV.	Constrained Methods	14
	A. Penalty and Barrier Function Methods	
	B. Augmented Lagrangian Methods	
	C. Projected Lagrangian Methods	
V.	Neurodynamic Optimization	6
	A. Neurodynamic Models	
	B. Stability Analysis	
	C. Simulation	