Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): ORBS7010 Prescriptive Analytics for Decision Making (3,3,0)

Course Aims: The aim of this course is to introduce students to optimisation modelling and solution techniques, typical applications areas within strategic/operation business planning for industrial development, and the use of commercial optimisation software.

Prerequisite: No

Prepared by: Luo Dehui

Remark: This course is delivered by staff of University of Kent.

Course Intended Learning Outcomes (CILOs):

Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
1	Explain a comprehensive understanding of quantitative models for decision making.
2	Explain how complex real-world economic activity can be represented in mathematical form.
3	Exhibit a systematic knowledge of some classic business, management, and issues of industrial performance, formulate them mathematically, and solve them.
4	Assess an ability to deal with various real-world complexities and incorporate these into the modelling framework in order to prescribe actionable recommendations for enterprises.
5	Apply models using industry-standard software and perform analyses to support industrial development and management.

Teaching & Learning Activities (TLAs):

CILO	TLAs will include the following:
1,2,3,4,5	New concepts will be introduced in lectures, together with instructions and any requisite theory. Where possible, theory will be demonstrated using practical examples.
3,4,5	Computer terminals will afford students the opportunity of putting theory into practice and will include learning how to model, analyse, and perform calculations using Excel spreadsheets.

Assessment:

No.	Assessment Methods	Weighting	CILO Addressed	Remarks
1	Project	100%	all	The course will be assessed 100% by a written report (~2000-4000 words) on the use of optimisation modelling and solution methods applied to a realistic case-study problem. The coursework will assess students' comprehension of key topics introduced in the course, as well as require them to demonstrate their model building and analytical skills.

Course Intended Learning Outcomes and Weighting:

Content	CILO No.	Teaching (in hours)
1. Linear Programming	1,2,3,4,5	18
2. Network Models	1,2,3,4,5	12
3. Integer Programming	1,2,3,4,5	9

References:

1. Anderson, D.R., Sweeney, D.J., Williams, T.A., Martin, R.K. (2012) *An Introduction to Management Science: Quantitative Approaches to Decision Making*, 13th Edition. Mason: Cengage.
2. Hillier, F.S, Lieberman G.J. (2005) *Introduction to Operations Research*, 8th Edition. Boston: McGraw Hill.
3. Winston, W.L. (2004) *Operations Research: Applications and Algorithms*, 4th Edition. Belmont: Duxbury Press.
4. Reeves, C.R. (1995) *Modern Heuristic Techniques for Combinatorial Problems*. New York: Blackwell Scientific.
5. Williams, H.P. (1990) *Model Building in Mathematical Programming*. New York: Wiley.
6. Williams, H.P. (1993) *Model Solving in Mathematical Programming*. New York: Wiley.

Course Content in Outline:

1. Linear Programming: Students will be introduced to the building blocks of optimisation (i.e. decision variables, objectives, constraints), how to mathematically formulate linear programming (LP) models, LP solution techniques, sensitivity analysis (e.g. range of optimality reduced costs, dual prices), and typical applications like production planning, scheduling, and portfolio selection.
2. Network Models: This topic includes a range of concepts and modelling techniques for formulating classic network models, including transportation and assignment, shortest path, maximum flow, and minimum spanning tree problems, and common solution approaches.
3. Integer Programming: This will cover integer linear programming (ILP) models, including binary integer models, classic exact and heuristic solution methods (e.g. branch and bound, greedy heuristics), and typical application areas of ILP, including capital budgeting, fixed charge production, and facility location.

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