

Lingnan University
Department of Computing and Decision Sciences
Course Syllabus

Course Title	:	Quantitative Decision Making
Course Code	:	CDS2004
Recommended Study Year	:	2
No. of Credits/Term	:	3
Mode of Tuition	:	Sectional Approach
Class Contact Hours	:	3 hours per week
Category in Major Prog.	:	Required
Prerequisite(s)	:	(a) CDS1003 Probability and Statistics 1, or (b) BUS1102 Statistics for Business
Co-requisite	:	Nil
Exclusion	:	Nil
Exemption Requirement	:	Nil

Brief Course Description:

Organisations and individuals must often make decisions in their best interests in different situations. This course provides an introduction to modelling, analysing and solving decision problems under certainty and uncertainty. Students will develop the concepts of uncertainty and utility and learn how to apply quantitative techniques of optimisation, forecasting and simulation to solve a variety of problems that arise in business settings. Microsoft Excel is used to model and solve many of these problems. By practising these techniques and Excel functions, students are expected to develop basic analytical skills and acquire competency in Excel.

Aims:

This course aims to:

1. introduce a range of quantitative decision-making techniques that can be used for modeling business decision problems;
2. develop students' ability to think critically and make decisions in a scientific and systematic way;
3. enhance students' quantitative and analytical skills as well as computer-based problem-solving skills;
4. enable students to apply appropriate decision-making techniques and Excel to formulate mathematical and computer-based models and obtain the best decisions for real-world problems;
5. provide practical training to students in arriving at solutions for practical problems.

Learning Outcomes (LOs):

Upon successful completion of the course, students will be able to:

1. Use analytical skills to create a precise and structured understanding of a complex business problem;
2. Identify appropriate quantitative techniques for making decisions in various contexts;
3. Formulate well-structured mathematical and spreadsheet models;

4. Employ Microsoft Excel to solve practical problems and present results;
5. Interpret results in a managerial setting and make recommendations.

Indicative Contents:

Students will learn decision-making methodologies and spreadsheet modeling through solving a variety of practical problems in the following areas:

1. Introduction to spreadsheet modeling
Basic spreadsheet modeling concepts and best practices, basic Excel terms, breakeven analysis, indifference point analysis
2. Linear programming models
Common elements of optimization problems; feasible, infeasible, and optimal solutions; Excel Solver, sensitivity analysis
3. Optimization models with integer variables
Integer variables, binary variables, LP relaxation
4. Network models
Transportation model, assignment models
5. Nonlinear optimization models
Global optimum, local optimum
6. Decision making under uncertainty
Decision criteria, payoff table, expected monetary value, utility function
7. Forecasting models
Time series, moving average, exponential smoothing

Teaching Method:

Basic concepts and techniques will be introduced using lectures. The spreadsheet-based teaching and learning method will be used extensively throughout the course. We will teach quantitative decision-making techniques as well as Excel functions and tools through solving practical problems and guiding students to build models for each problem step by step. Microsoft Excel will be employed for obtaining quantitative solutions for many of the problems.

Assessment:

Class Attendance and Participation	5%
Assignments	25%
Mid-term Test	15%
Group Case Study	15%
Final Examination	40%
Total	100%

Measurement of Learning Outcomes:

1. Class participation, individual assignments, and a group case study are used to facilitate and evaluate students' understanding of concepts and techniques of decision-making in various contexts and their competency of using Excel to formulate the problems and find the best decisions. (LO 1, 2, 3, 4, 5)
2. A midterm test and a final examination are used to assess students' comprehension of the concepts and methodologies, and to assess their ability to apply quantitative techniques and Microsoft Excel to decision-making problems. (LO 2, 3, 4, 5)

Required/Essential Readings:

1. Winston, W. L., and S. C. Albright. *Management Science Modeling, 4th Edition*. South Western, Cengage Learning, USA, 2012.

Recommended/Supplementary Readings:

1. Moore, J. H., and L. R. Weatherford. *Decision Modeling with Microsoft Excel, 6th Edition*. Prentice Hall, New Jersey, 2001.

Important Notes:

- (1) Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.
- (2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations. In particular, plagiarism, being a kind of dishonest practice, is “the presentation of another person’s work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student’s own work”. Students are required to strictly follow university regulations governing academic integrity and honesty.
- (3) Students are required to submit writing assignment(s) using Turnitin.
- (4) To enhance students’ understanding of plagiarism, a mini-course “Online Tutorial on Plagiarism Awareness” is available on <https://pla.ln.edu.hk/>.

Rubric for Midterm Test of CDS2004 - Quantitative Decision Making

Criteria	Excellent (≥80%)	Good (65% - 79%)	Satisfactory (50% - 64%)	Unsatisfactory (35% - 49%)	Very Poor (0% - 34%)
Identify appropriate quantitative techniques for making decisions (ILO 2)	Demonstrates a strong capability of identifying appropriate quantitative techniques for making decisions	Demonstrates a good capability of identifying appropriate quantitative techniques for making decisions	Demonstrates an adequate level of capability of identifying appropriate quantitative techniques for making decisions	Identifies a limited number of appropriate quantitative techniques for making decisions	Fails to identify appropriate quantitative techniques for making decisions
Formulate well-structured mathematical and spreadsheet models (ILO 3)	Formulates mathematical and spreadsheet models with all necessary components as well as strong readability and flexibility	Formulates mathematical and spreadsheet models with major components as well as good readability and flexibility	Formulates mathematical and spreadsheet models with most components as well as acceptable readability and flexibility	Formulates mathematical and spreadsheet models with limited components as well as low readability and flexibility	Fails to formulate structured mathematical and spreadsheet models
Employ Microsoft Excel to solve practical problems and present results appropriately (???) (ILO 4)	Demonstrates a strong capability of employing Microsoft Excel to correctly solve practical problems and appropriately present results	Demonstrates a good capability of employing Microsoft Excel to correctly solve practical problems and present most results appropriately.	Able to employ an adequate amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Only able to employ a limited amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Fails to employ Microsoft Excel to solve practical problems and present results
Interpret results in a managerial setting and make recommendations (ILO 5)	Provides a thorough and correct managerial interpretation of all the results and makes complete recommendations	Provides a relatively thorough and correct managerial interpretation for most of the results and makes major recommendations	Provides a correct managerial interpretation for the main results and makes adequate recommendations	Provides a managerial interpretation for some results and makes limited recommendations	Fails to interpret results and makes very limited recommendations

Rubric for Final Examination of CDS2004 - Quantitative Decision Making

Criteria	Excellent (≥80%)	Good (65% - 79%)	Satisfactory (50% - 64%)	Unsatisfactory (35% - 49%)	Very Poor (0% - 34%)
Identify appropriate quantitative techniques for making decisions	Demonstrates a strong capability of identifying appropriate quantitative techniques for making decisions	Demonstrates a good capability of identifying appropriate quantitative techniques for making decisions	Demonstrates an adequate level of capability of identifying appropriate quantitative techniques for making decisions	Identifies a limited number of appropriate quantitative techniques for making decisions	Fails to identify appropriate quantitative techniques for making decisions
Formulate well-structured mathematical and spreadsheet models	Formulates mathematical and spreadsheet models with all necessary components as well as strong readability and flexibility	Formulates mathematical and spreadsheet models with major components as well as good readability and flexibility	Formulates mathematical and spreadsheet models with most components as well as acceptable readability and flexibility	Formulates mathematical and spreadsheet models with limited components as well as low readability and flexibility	Fails to formulate structured mathematical and spreadsheet models
Employ Microsoft Excel to solve practical problems and present results appropriately (??)	Demonstrates a strong capability of employing Microsoft Excel to correctly solve practical problems and present results appropriately.	Demonstrates a good capability of employing Microsoft Excel to correctly solve practical problems and present most results appropriately.	Able to employ an adequate amount of Microsoft Excel tools and functions to correctly solve many practical problems and present results	Only able to employ a limited amount of Microsoft Excel tools and functions to correctly solve some practical problems and present results	Fails to employ Microsoft Excel to solve practical problems and present results
Interpret results in a managerial setting and make recommendations	Provides a thorough and correct managerial interpretation of all the results and makes complete recommendations	Provides a relatively thorough and correct managerial interpretation for most of the results and makes major recommendations	Provides a correct managerial interpretation for the main results and makes adequate recommendations	Provides a managerial interpretation for some results and makes limited recommendations	Fails to interpret results and makes very limited recommendations

Rubric for Group Case Study of CDS2004 - Quantitative Decision Making

Criteria	Excellent (≥80%)	Good (65% - 79%)	Satisfactory (50% - 64%)	Unsatisfactory (35% - 49%)	Very Poor (0% - 34%)
Use analytical skills to create a precise and structured understanding of a complex business problem	Use analytical skills to create a highly precise and structured understanding of a complex business problem	Use analytical skills to create a relatively precise and structured understanding of a complex business problem	Use analytical skills to create an understanding of a complex business problem with satisfactory accuracy and structure	Use analytical skills to create a limited understanding of a complex business problem without a clear structure	Fail to use analytical skills to create an understanding of a complex business problem
Identify appropriate quantitative techniques for making decisions	Demonstrate a strong capability of identifying appropriate quantitative techniques for making decisions	Demonstrate a good capability of identifying appropriate quantitative techniques for making decisions	Demonstrate an adequate level of capability of identifying appropriate quantitative techniques for making decisions	Identify a limited number of appropriate quantitative techniques for making decisions	Fail to identify appropriate quantitative techniques for making decisions
Formulate well-structured mathematical and spreadsheet models	Formulate mathematical and spreadsheet models with all necessary components as well as strong readability and flexibility	Formulate mathematical and spreadsheet models with major components as well as good readability and flexibility	Formulate mathematical and spreadsheet models with most components as well as acceptable readability and flexibility	Formulate mathematical and spreadsheet models with limited components as well as low readability and flexibility	Fail to formulate structured mathematical and spreadsheet models
Employ Microsoft Excel to solve practical problems and present results	Demonstrates a strong capability of employing Microsoft Excel to correctly solve practical problems and present results	Demonstrates a good capability of employing Microsoft Excel to correctly solve practical problems and present results	Able to employ an adequate amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Only able to employ a limited amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Fail to employ Microsoft Excel to solve practical problems and present results
Interpret results in a managerial setting and make recommendations	Provide a thorough and correct managerial interpretation of all the results and make complete recommendations	Provide a relatively thorough and correct managerial interpretation for most of the results and make major recommendations	Provide a correct managerial interpretation for the main results and make adequate recommendations	Provide a managerial interpretation for some results and make limited recommendations	Fail to interpret results and make very limited recommendations

Rubric for Assignment of CDS2004 - Quantitative Decision Making

Criteria	Excellent (≥80%)	Good (65% - 79%)	Satisfactory (50% - 64%)	Unsatisfactory (35% - 49%)	Very Poor (0% - 34%)
Identify appropriate quantitative techniques for making decisions	Demonstrates a strong capability of identifying appropriate quantitative techniques for making decisions	Demonstrates a good capability of identifying appropriate quantitative techniques for making decisions	Demonstrates an adequate level of capability of identifying appropriate quantitative techniques for making decisions	Identifies a limited number of appropriate quantitative techniques for making decisions	Fail to identify appropriate quantitative techniques for making decisions
Formulate well-structured mathematical and spreadsheet models	Formulates mathematical and spreadsheet models with all necessary components as well as strong readability and flexibility	Formulates mathematical and spreadsheet models with major components as well as good readability and flexibility	Formulates mathematical and spreadsheet models with most components as well as acceptable readability and flexibility	Formulates mathematical and spreadsheet models with limited components as well as low readability and flexibility	Fail to formulate structured mathematical and spreadsheet models
Employ Microsoft Excel to solve practical problems and present results	Demonstrates a strong capability of employing Microsoft Excel to correctly solve practical problems and present results	Demonstrates a good capability of employing Microsoft Excel to correctly solve practical problems and present results	Able to employ an adequate amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Only able to employ a limited amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Fail to employ Microsoft Excel to solve practical problems and present results
Interpret results in a managerial setting and make recommendations	Provides a thorough and correct managerial interpretation of all the results and makes complete recommendations	Provides a relatively thorough and correct managerial interpretation for most of the results and makes major recommendations	Provides a correct managerial interpretation for the main results and makes adequate recommendations	Provides a managerial interpretation for some results and makes limited recommendations	Fail to interpret results and makes very limited recommendations

Rubric for In-Class Participation of CDS2004 - Quantitative Decision Making

Criteria	Excellent (≥80%)	Good (65% - 79%)	Satisfactory (50% - 64%)	Unsatisfactory (35% - 49%)	Very Poor (0% - 34%)
Use analytical skills to create a precise and structured understanding of a complex business problem	Uses analytical skills to create a highly precise and structured understanding of a complex business problem	Uses analytical skills to create a relatively precise and structured understanding of a complex business problem	Uses analytical skills to create an understanding of a complex business problem with satisfactory accuracy and structure	Uses analytical skills to create a limited understanding of a complex business problem without a clear structure	Fails to use analytical skills to create an understanding of a complex business problem
Formulate well-structured mathematical and spreadsheet models	Formulates mathematical and spreadsheet models with all necessary components as well as strong readability and flexibility	Formulates mathematical and spreadsheet models with major components as well as good readability and flexibility	Formulates mathematical and spreadsheet models with most components as well as acceptable readability and flexibility	Formulates mathematical and spreadsheet models with limited components as well as low readability and flexibility	Fails to formulate structured mathematical and spreadsheet models
Employ Microsoft Excel to solve practical problems and present results	Demonstrates a strong capability of employing Microsoft Excel to correctly solve practical problems and present results	Demonstrates a good capability of employing Microsoft Excel to correctly solve practical problems and present results	Able to employ an adequate amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Only able to employ a limited amount of Microsoft Excel tools and functions to correctly solve practical problems and present results	Fails to employ Microsoft Excel to solve practical problems and present results