GENERAL INFORMATION

Instructor: Dr. Wei ZHANG  
Email: wzhang15@hku.hk  
Office: KK 814  
Phone: 3917 1685  
Consultation times: By appointment

Tutor: Beatriz Acero Lopez  
Email: bacero@hku.hk

Pre-requisites: None  
Co-requisites: None  
Mutually exclusive: N/A

Course Website: TBD  
Reference Book:  
The following programming languages are used in this course: R and Python. IBM ILOG CPLEX Optimization Studio (free download here) is also used.

COURSE DESCRIPTION

Business decision making involves considerable complexity and uncertainty. To assist decision making, managers need to tease out useful information from data. In particular, managers should be able to use data to evaluate the impact of their decisions and to make predictions for their decisions. To make decisions in a scientific way, managers need to be able to build mathematical models for their decisions and solve their problems with the help of computer software. This course introduces a wide array of quantitative analysis methods to help students gain a clear understanding of the decision making process in business and management. These methods provide students with the tools and skills to approach, analyze, and solve problems of varying scales. Furthermore, this course aims at improving a decision-maker’s overall problem solving ability by stressing approaches to 1) understand and question assumptions, 2) consider a richer set of solution alternatives, and 3) consider diverse measures of performance. The teaching methods will include lectures, discussions, and demonstration of several software packages.

COURSE OBJECTIVES

By introducing rigorous quantitative methods and theories, this course demonstrates ways to apply structured thinking on loosely defined business problems in reality. Upon successfully completing this course, you should be able to

1. Employ solid statistical methods for decision making,
2. Understand how to apply quantitative models and theories in business,
3. Structurize and model management problems effectively, and
4. Use software tools to model and solve decision problems.

PROGRAMME LEARNING OUTCOMES

PLO1: Acquisition and internalization of knowledge of the programme discipline
PLO2: Application and integration of knowledge
PLO3: Inculcating professionalism and leadership
PLO4: Developing global outlook
PLO5: Mastering communication skills
## COURSE LEARNING OUTCOMES

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>Aligned Programme Learning Outcomes</th>
</tr>
</thead>
</table>
![](https://via.placeholder.com/15/33FF66/000000?text=CLO1)| PLO1 |
![](https://via.placeholder.com/15/33FF66/000000?text=CLO2)| PLO2 |
![](https://via.placeholder.com/15/33FF66/000000?text=CLO3)| PLO2, 4 |
![](https://via.placeholder.com/15/33FF66/000000?text=CLO4)| PLO3, 5 |

## COURSE TEACHING AND LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>Course Teaching and Learning Activities</th>
<th>Expected contact hour</th>
<th>Study Load (% of study)</th>
</tr>
</thead>
</table>
![](https://via.placeholder.com/15/33FF66/000000?text=T&L1)| 30 | 23% |
![](https://via.placeholder.com/15/33FF66/000000?text=T&L2)| 10 | 8% |
![](https://via.placeholder.com/15/33FF66/000000?text=T&L3)| 50 | 38% |
![](https://via.placeholder.com/15/33FF66/000000?text=T&L4)| 40 | 31% |
| Total | 130 | 100% |

## Assessment Methods

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Brief Description (Optional)</th>
<th>Weight</th>
<th>Aligned Course Learning Outcomes</th>
</tr>
</thead>
</table>
![](https://via.placeholder.com/15/33FF66/000000?text=A1)| Attendance & discussions | 20% | CLO1, 2, 4 |
![](https://via.placeholder.com/15/33FF66/000000?text=A2)| Effort and accuracy | 30% | CLO1, 2, 3, 4 |
![](https://via.placeholder.com/15/33FF66/000000?text=A3)| Effort and accuracy | 50% | CLO1, 2, 4 |
| Total | | 100% |

## STANDARDS FOR ASSESSMENT

### Course Grade Descriptors

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
</table>
| **A+**, **A**, **A-** | • Demonstrate a strong understanding of all relevant knowledge  
• Handling questions professionally  
• High participation in discussions  
• Present arguments that have an element of originality  
• Achieve a standard of excellent performance in the exams with very accurate computation and very good analytical and problem solving skills  
• Excellent performance in assignments |
| **B+**, **B**, **B-** | • Demonstrate a good understanding of all relevant knowledge  
• Handling questions in a logical way  
• Good participation in discussions  
• Present arguments that go beyond the lecture and textbook  
• Achieve a standard of good performance in the exams with accurate computation and good analytical and problem solving skills  
• Good performance in assignments |
| **C+**, **C**, **C-** | • Demonstrate a basic understanding of the concepts involved  
• Fairly address questions as set  
• Some participation in discussions  
• Present arguments in a well-structure manner  
• Meet a standard of acceptable performance in the exams with reasonably accurate computation and acceptable analytical and problem solving skills  
• Acceptable performance in assignments |
<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
</table>
| D+, D | • Demonstrate a minimum understanding of the concepts involved  
• Barely address questions as set  
• Minimal or no participation in discussions  
• Present arguments in a marginally acceptable manner  
• Meet a standard of marginally acceptable performance in the exams with some errors in computation and barely adequate analytical and problem solving skills  
• Marginally acceptable performance in assignments |
| F | • Demonstrate a poor understanding of the concepts involved  
• Unable or unwilling to handle questions  
• Minimal or no participation in discussions  
• Present arguments poorly  
• Fail to meet a standard of passing the exams with major errors in computation and inadequate analytical and problem solving skills  
• Poorly performance in assignments |

### Assessment Rubrics for Participation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
</table>
| A+, A, A- | • High participation in discussions  
• Always attend in-class discussions  
• Demonstrate a strong understanding of all relevant knowledge  
• Handling questions professionally  
• Present arguments that have an element of originality  
• Respect others and follow the class rules (no chatting and do not use cell phone) |
| B+, B, B- | • Good participation in discussions  
• Often attend in-class discussions  
• Demonstrate a good understanding of all relevant knowledge  
• Handling questions in a logical way  
• Present arguments that go beyond the lecture and textbook  
• Respect others and follow the class rules (no chatting and do not use cell phone) |
| C+, C, C- | • Some participation in discussions  
• Sometimes attend in-class discussions  
• Demonstrate a basic understanding of the concepts involved  
• Fairly address questions as set  
• Present arguments in a well-structure manner  
• Respect others and follow the class rules (no chatting and do not use cell phone) |
| D+, D | • Minimal or no participation in discussions  
• Rarely attend in-class discussions  
• Demonstrate a minimum understanding of the concepts involved  
• Barely address questions as set  
• Present arguments in a marginally acceptable manner  
• Respect others and follow the class rules (no chatting and do not use cell phone) |
| F | • Minimal or no participation in discussions  
• Almost never attend in-class discussions  
• Demonstrate a poor understanding of the concepts involved  
• Unable or unwilling to handle questions  
• Present arguments poorly  
• Behave poorly in class (often chatting with others, using cell phones, or being late) |

### Assessment Rubrics for Assignments and the Exam

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
</table>
| A+, A, A- | • Demonstrate a strong understanding of all relevant knowledge  
• Present arguments that have an element of originality  
• Achieve a standard of excellent performance in the assessments with very accurate computation and very good analytical and problem solving skills |
| B+, B, B- | • Demonstrate a good understanding of all relevant knowledge  
• Present arguments that go beyond the lecture and textbook  
• Achieve a standard of good performance in the assessments with accurate computation and good analytical and problem solving skills |
| C+, C, C- | • Demonstrate a basic understanding of the concepts involved  
• Present arguments in a well-structure manner  
• Meet a standard of acceptable performance in the assessments with reasonably accurate computation and acceptable analytical and problem solving skills |
D+, D

- Demonstrate a minimum understanding of the concepts involved
- Present arguments in a marginally acceptable manner
- Meet a standard of marginally acceptable performance in the assessments with some errors in computation and barely adequate analytical and problem solving skills

F

- Demonstrate a poor understanding of the concepts involved
- Present arguments poorly
- Fail to meet a standard of passing the assessments with major errors in computation and inadequate analytical and problem solving skills

COURSE CONTENT AND TENTATIVE TEACHING SCHEDULE

Session 1: September 7 (Thursday) 2:00pm – 5:00pm @ Classroom A-B, 3/F, Cyberport 4
  - Probability and Statistics (Bayes Theorem; Random variables and distributions; Markov analysis)

Session 2: September 9 (Saturday) 9:30am – 12:30pm @ Classroom A-B, 3/F, Cyberport 4
  - Regression Models (OLS; Significance tests; Multicollinearity; Dummy variables)

Session 3: September 14 (Thursday) 2:00pm – 5:00pm @ Classroom D, 3/F, Cyberport 4
  - Causal Inference (Causal graphs; Counterfactual model; Matching)

Session 4: September 16 (Saturday) 9:30am – 12:30pm @ Classroom D, 3/F, Cyberport 4
  - Causal Inference (Omitted variable bias; Instrumental variable; 2SLS)

Session 5: September 21 (Thursday) 2:00pm – 5:00pm @ Classroom A-B, 3/F, Cyberport 4
  - Statistical Analysis with R (Case project: B2B sales analysis)

Session 6: September 23 (Saturday) 9:30am – 12:30pm @ Classroom A-B, 3/F, Cyberport 4
  - Linear Programming (Graphical solution method; Sensitivity analysis; Applications)

Session 7: September 28 (Thursday) 2:00pm – 5:00pm @ Classroom A-B, 3/F, Cyberport 4
  - Mixed Integer Programming (Modeling techniques; Applications; LP relaxation)

Session 8: September 30 (Saturday) 9:30am – 12:30pm @ Classroom A-B, 3/F, Cyberport 4
  - Nonlinear Programming (Convex functions; Quadratically constrained programming; Applications)

Session 9: October 7 (Saturday) 9:30am – 12:30pm @ Classroom A-B, 3/F, Cyberport 4
  - Approximations and Bounds (Lagrange relaxation; Dual problem; Bounds)

Session 10: October 11 (Wednesday) 2:00pm – 5:00pm @ Classroom A-B, 3/F, Cyberport 4
  - Optimization in CPLEX and Python (Case project: Retail assortment, inventory, and shelf space management)

Final Exam: October 14 (Saturday) 2:00pm – 5:00pm @ Classroom A-B, 3/F, Cyberport 4

REQUIRED/RECOMMENDED READINGS & ONLINE MATERIALS (e.g. journals, textbooks, website addresses etc.)

To be announced on Moodle.

MEANS/PROCESSES FOR STUDENT FEEDBACK ON COURSE

- Conducting mid-term survey in additional to SETL around the end of the semester

  - Online response via Moodle site
  - Others: ___________________________ (please specify)

COURSE POLICY (e.g. plagiarism, academic honesty, attendance, etc.)

An orderly learning environment is extremely important for this course. Disruptive behaviors are absolutely unacceptable. Academic dishonesty includes cheating, plagiarism, unauthorized collaboration, falsifying academic records, and any act designed to avoid participating honestly in the learning process. Any such dishonesty will result in an F grade.

ADDITIONAL COURSE INFORMATION (e.g. e-learning platforms & materials, penalty for late assignments, etc.)

Assignments will be submitted in class before the lectures. No late assignment will be accepted. Lecture notes and self-learning materials will be uploaded on Moodle. Good questions and discussions on Moodle will be awarded participation grades.