ISOM 4830: Analytics for Service Operations

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Course Description & Objectives

This course focuses on concepts and tools that can generate operational excellence for the production and delivery of services across various industries including health care, ride-hailing, advertising, and content markets. Unlike traditional product markets, a salient feature of these industries is that services are intangible and not storable, and often highly variable, which raises significant challenges in decision making. The goal of this course is to improve the understanding of these challenges and to learn how to overcome the obstacles with data-driven quantitative models. This class will introduce simple predictive and prescriptive methods that are useful in service operations. Students will also have the opportunity to apply these concepts in various service industries via case studies and homework assignments.

Course Material

There is no textbook for this course. All necessary material will be available on the course website http://canvas.ust.hk/. The website provides important download material, including assignments, data files, simulations/games, course slides, as well as additional readings and announcements. So you will have to check the website regularly.

Course Requirements

You cannot master the material for this course without systematic practice. Hence, there will be individual assignments throughout the course. There is an individual assignment for (almost) every week. Each assignment involves a conceptual component and some Excel-based analysis. While you do not have to be a spreadsheet expert, the course is not recommended for students who are not disposed to "play around" with data, or to dedicate systematic effort outside of class. The grade will count the assessments using the following proportions:

Class participation	12%
Individual assignments 1	8%
Individual assignments 2	8%
Individual assignments 3	8%
Individual assignments 4	8%
Individual assignments 5	8%
Individual assignments 6	8%
Final exam part I (Computer-based)	20%
Final exam part II (Paper-based)	20%
Total	100%

- *Class participation.* This is a qualitative assessment of your contribution to classroom learning. For each class, you are expected to complete the assigned readings and be prepared to discuss the case questions. You can contribute by asking critical questions and providing constructive suggestions during discussions. The instructor will assess the significance of your contributions and factor them into your grade.
- *Individual assignments.* There are 6 homework assignments that each student will study independently. Follow the instructions and the deadlines once the assignments are posted on canvas. Late submission will not be accepted.

Academic Integrity

Students at HKUST are expected to observe the Academic Honor Code at all times (see http:// rpghandbook.ust.hk/student-conduct-and-academic-integrity#honor for more information). Zero tolerance is shown to those who are caught cheating on exam. In addition to receiving a zero mark on the exam involved, the final course grade will appear on your record with an X, to show that the grade resulted from cheating. This X grade will stay with your record until graduation. If you receive another X grade, you will be dismissed from HKUST.

Course Outline

The learning goals below should be viewed as the key concepts you should grasp after each session, and also as a study guide before each exam, and at the end of the semester.

Week 1: Course Preliminaries I

- Course Intro & Logistics
- Excel Basics

Week 2: Course Preliminaries II

- Optimization Models and Spreadsheet Optimization
- Mini Case Study I: Shelby Shelving
- Mini Case Study II: Online Matching

Week 3: Analytics for Personalized Services I

- Regressions and Optimization
- Case Study: Tahoe Healthcare Systems

Week 4: Analytics for Personalized Services II

- Collaborative Filtering
- Case Study: Pandora Internet Radio

Week 5: Analytics for Personalized Services III

- Personalized Pricing
- Case Study: Nomis Solutions

Week 6: Queueing Analytics I

- Fundamentals in Queueing Theories—Part A
- Single- and Multi-Server Queueing Models

Week 7: Queueing Analytics II

- Fundamentals in Queueing Theories—Part B
- Service Level, Capacity Planning, and More

Week 8: Queueing Analytics III

- Applications of G/G/s Queueing Models
- Case Study: Emergency Department Congestion at Saintemarie University Hospital

Week 9: Queueing Analytics IV

- Predictive Analytics for Queueing
- Case Study: Announcing Waiting Time in Emergency Departments

Week 10: Queueing Analytics V

• Monte Carlo Simulation for Queueing

Week 11: Data Envelopment Analysis (DEA)

• Case Study: Din Tai Fung

Week 12: Other Topics and Course Wrap-Up

- Monte Carlo Simulation for Pension Analytics
- Course Review for Final Exam