ISOM 4830: Analytics for Service Operations

Spring, 2024

Instructor: **Prof. Dongwook Shin** (dwshin@ust.hk)
Office Hours: By appointment
Office: LSK 4068

Teaching Assistant: **Wenjuan Li** (wenjuan.li@connect.ust.hk)
Office Hours: 4-5pm Thursdays
Office: LSK 5067

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 by conducting a group project.

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 and group 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. There will be one group assignment to be presented around the end of the course. The grade will count the assessments using the following proportions:

Class participation	8%
Individual assignments (6)	42%
Final project and presentation	30%
Final exam	20%
Total	**100%**

- *Class participation.* This is a qualitative measure of your contribution to classroom learning. For each class, you are required to do the pre-assigned readings, and prepare to discuss the case questions in class. Attendance, quality of participation (impact), respect for others, and a good attitude are key elements of a high participation 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. Each assignment is graded according on a 10-point scale as follows.

	4-5	3-4	2-3	0-2
Identification of the main issues/problems	Demonstrate in-depth understanding of the case; identify all main issues	Demonstrate a good understanding of the case; identify most of main issues	Demonstrate some understanding of the case; identify some of main issues	Demonstrate litte/no understanding of the case; identify few of main issues
Comparison & Comments	Well-reasoned comments with precise and careful comparisons	Well thought-out comments with comprehensive comparison	Superficial or ad hoc and imprecise comments	Little/no comments

- *Final project and presentation.* You are required to form a group of size 4 and submit the list of group members to the teaching assistant by March 1. The project will be an opportunity for you to get creative and seek out analytical opportunities for service operations. The topics for the final projects will be given by the instructor, and each group will be randomly assigned to one of the topics. Your job is to identify opportunities for improvements in service operations in your assigned topic. You are expected to construct a model that can be used to assist the improvement. You should explain how the improvement will be implemented and preferably provide an estimate on the expected magnitude of improvement (justified based on some initial data). Basically, you can consider this as a proposal to a company from either a consulting firm or an internal consulting department.

  You may make suitable assumptions for your analysis. If the data provided by the instructor is not sufficient, you may collect data from real-world applications for your project. Note that you may use any tools (other than Excel) for your project.

  A three-page report is due on May 1. Each team will be given time to present its project in the last two weeks of the semester. I will decide on the presentation schedule after I receive the proposals.

Your grade for the project will be based on my assessment of the project, your presentation, how you handle the questions raised in the class on your project and also how your teammates evaluate you. The table below should give you an idea on how the project will be evaluated:

	4-5	3-4	2-3	0-2
Problem identification	Well defined and explained; a large amount of original thought; problem with very significant potential improvement	Well defined and explained; some original thought; problem with significant potential improvement	Interesting problem identified, but there is little evidence of original thinking, or unclear potential improvement	It is not clear what the real problem is
Model and data	Appropriate and rigorous model but yet not overly complicated; excellent plan for data collection	Appropriate and rigorous model, but some fine-tuning is required; some good ideas of how data can be collected	Appropriate model, but major adjustment is required; little idea of how data can be collected	Inappropriate model, and/or major errors in the model; no idea on how data can be collected
Implementation planning	Concrete and comprehensive plans; show considerations for all key ideas; specific on how to measure the benefit	Good and realistic plan for data collection and improvement implementation	There are some good points in the plan, but the plan is either too vague or some ideas are unrealistic	No or little clue about what data is needed and how the improvement should be implemented; or plans are unrealistic or illogical
Delivery (presentation)	Excellent use of visuals; very clear and concise flow of ideas; demonstrate and stimulate passion	Good use of visuals; clear flow of ideas; demonstrate interest	Limited and/or not so good use of visuals; ideas presented but focus is lost at times; limited evidence of interest	No use of visuals; hard to follow ideas; lack of enthusiasm and interest
Response to questions/comments (presentation)	Excellent response; demonstrate in-depth considerations of most issues	Good response; demonstrate in-depth considerations of most issues	Satisfactory response; demonstrate considerations of some of the issues	Limited response; demonstrate a lack of considerations of significant issues

Also, the table below will be used to evaluate your team members, including yourself. For each category, you will evaluate each team member and give a grade. All responses are confidential. You must hand in this form by the end of class on May 10. Failure to do so will reduce your own total score by 1 point.

Team member (Name and student ID)	Attendance	Contribution	Quality of work	Collaborative attitude	Time management	Total

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 schedule is tentative and subject to change. 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: Introduction to service operations analytics and advanced Excel

Week 2: Basic optimization models and Excel Solver

Week 3: Regressions using Excel

- Case study: Tahoe Healthcare Systems

Week 4: Collaborative filtering

- Case study: Pandora Internet Radio

Week 5: Pricing analytics

- Case study: Nomis Solutions

Week 6-9: Queueing analytics

- Fundamentals in queueing theories (2 weeks)
- Case study: Emergency Department Congestion at Saintemarie University Hospital
- Simulations for queueing

Week 10: Data Envelope Analysis (DEA)

- Case study: Din Tai Fung

Week 11: Other topics in service operations and course wrap-up

Week 12-13: Final presentation of group projects