## 097135 – Multi-disciplinary research in service engineering

**Time:** Thursdays. Lecture at 12:30-15:30; Recitation at 15:30-16:30.

**Place:** TBD

**Lecturer:**
Galit Yom-Tov, Bloomfield 519, 829-4510, gality@technion.ac.il

**Teaching Assistant:**
TBD

**Course Short Description**
In this course we will focus on examining service systems from multiple aspects. We will examine them from Behavioral, Economical, Data Science, and Operations Research perspectives. We will do that by examining research papers that come from the different disciplines mentioned above. Using these papers, we will look into new developments in the field of service science. Emphasis will be placed on research methodologies such as queueing theory, data science, and behavioral experiments.

We aim to have students from all our faculty disciplines come together during this course and want to encourage you to learn how all the above perspectives should be joined to better understand service systems.

**Course Description**
Human beings are critical to the functioning of the vast majority of operating systems, influencing both the way these systems work and how they perform. Yet, most formal analytical models of operations neglect to consider human behavior and how policies and information both impact and are influenced by such behavior. In this course, we will discuss service systems from a multi-disciplinary perspective that will explore the impact of behavioral, informational and computational perspectives in service systems. We will explore ways to understand human behavior in service systems via experimental and data analysis, and how to incorporate such behavior into operational models of service systems.

For the behavioral-operations interface, we will go into details of studies that have adopted a "behavioral operations perspective" and explore the theoretical and practical implications of incorporating behavioral and cognitive factors into models of operations. Specifically, we will address the following questions: 1) What is a behavioral perspective on operations? 2) What might be the intellectual added value of such a perspective? 3) What are the basic elements of behavioral operations research? 4) In what ways can we incorporate behavior aspects into queueing models? 5) Do operational decisions, such as staffing and routing, change when using such models?

From the information-operations interface, we will go into details of studies that have explored the theoretical and practical aspects of information given to customers and information use in control algorithms of service systems. Specifically, we will address the following questions: 1) How can we use information in order to improve service systems operations? 2) What is the impact of information accuracy? 3) What is the impact of information on customer behavior?

In this course, we will analyze service organizations such as contact-centers and hospitals. We will use real data of such systems from the SEELab.

## Course Structure
Students will learn from paper discussions, lectures, and projects. We might have guest speakers from other disciplines. Each week the lecture will cover a specific topic. The lecture will cover approximately 4-10 papers on that topic. One of those papers will be given to you as a reading assignment before class. There will be maximum of 10 such reading assignment over the semester. We will discuss the paper you are assigned to read (a) using Perusall platform at home, and (b) using in-depth discussion during lecture time. There will be also 4 case studies explored via homework and in the recitations. Finally, students will form teams to work on an 8-week project. The project will include a small research of a new question of your choice. You will choose the topic and the appropriate methodology for this project according to your educational background. The students can use data from the SEELab for these projects. (Data Science students that take this course as a "data course" are required to use data for this project.)

Graduating the course in Service-Engineering or an advance course in Stochastic Processes is required (if you have not taken either course and wish to take this course, please talk to the Lecturer). Graduating level courses in behavioral research or data science is recommended.

## Course Meetings and Communication
**COVID-19** - The course will be given in a synchronized fashion. As long as we are allowed to, the course will be given in a regular classroom.

This is expected to be a small and intimate course. Students will be required to be active participants in the class discussions.

There might be 1-2 lectures that are outside of regular class sessions, which are arranged to accommodate the schedules for guest speakers.

Moodle (email and the course references) and WhatsApp will be used as means of communication and coordination outside of class.

## Required Course Material
There is no required textbook. All of the required materials, including cases and articles, are provided in lectures and will be available via Moodle.

## Final Grade
The course grade will be determined as follows:

| | |
|---|---|
| Class participation | 5% |
| Paper discussions | 25% |
| Case studies | 20% |
| Project | 50% |

It is critical that all members of a team contribute significantly to the assignments. Team grades will be adjusted to the level of individual participation.

**Class Participation and Paper Presentation**

Most of the course is based on paper discussions. There will be 9-10 papers you will be required to read during the semester. While reading the paper a blog will be open on that paper using Perusall (access via Moodle). Each student will need to write at least three new comments on the paper. Comments can be questions of something unclear, thoughts regarding something that was done or was not done, etc. The student will also be required to reply to at least 5 comments of other students. In the beginning of the semester, to help you get started, we will list a few comments (or questions) with the paper. These questions are designed to provide a structured approach to tackling the paper, and as a suggestion for a discussion in the blog and also later in class. However, any novel insights that students bring to the discussion will be greatly appreciated.

Bonuses: Each student can choose to present one paper in class during the semester. You can get a bonus of up to 5 points for such a presentation. If you wish to do so, you need to tell the lecturer by the second class which paper you choose to present.

We will judge paper discussions by the depth and thoughtfulness of your comments in the blogs.
We will judge class participation on the level of preparedness for the paper discussions, the depth and thoughtfulness of your comments, and the degree to which you listen carefully and respond to your peers. (If you are unprepared for a class let us know before the class begins.)

**Written Case-Study Analyses (Homework)**

There will be 4 case studies during the semester. A case study is a "story" of a specific service company and the problems this company struggles with. You will need to analyze this case. Each case analysis will involve the following steps:
-       Show relationships among the important factors in the situation the company faces
-       Identify fundamental causes of problems
-       Generate recommendations of how to solve that problem
-       State and justify your assumptions explicitly
-       Describe the criteria that were used to generate the recommendations
-       Show clearly how your plan of action follows your analysis
Exhibits may be used to support the key points in your analyses. Any calculations and numbers used in your analyses should be explained clearly.

You can work in teams for those tasks. Each team should consist of 1 or 2 students. By the end of the first week, please email the TA your team members. The written case analyses are due at the beginning of the session when we discuss these cases.

Your analyses should be clear, concise and complete. As this might be the first course in which you perform case analysis, we shall provide detailed guidelines <u>for the first case</u> (much like a standard

homework assignment). The report should address the assigned questions in the detailed course outline. You are encouraged to offer additional insights.

**Project**
Groups consisting of 1 or 2 students will be required to work on a project over the course of 8 weeks (during the semester). The objective is to allow you to research a specific area of interest to you (that relate to service systems). We shall provide a list of topics for projects, but you may suggest one of your own. Our suggested topics are inspired by the papers we are discussing during class and designed to deepen the understanding of various aspects of the challenges of the paper.

By the end of the third week of the semester, please provide a one-page project proposal. It should articulate a clearly stated research objective. If project involve data, the students will need to find the supporting data for their projects themselves (we shall help here as much as we can).
Each team will be responsible for a project report and a final presentation during a specific class (typically during the last two weeks of the semester).