MIE 597 C: OPERATIONS RESEARCH IN HEALTHCARE

Tue-Thu: 4:00 pm – 5:15 pm

Marston Hall room 220

Instructor

Dr. Hari Balasubramanian
Assistant Professor,
Mechanical and Industrial Engineering,
160 Governors Drive, Amherst, MA, 01003
Email: hbalasubraman@ecs.umass.edu
Phone: 413-577-3208

Office Hours: noon-1pm: Monday

Website: On Spark

Course Summary

This course will cover operations research and systems engineering methods and their applications in healthcare delivery and medical decision making. The use of these methods for healthcare has recently become an active and growing area of research in diverse contexts such as organ transplant decisions, evaluation of cost effectiveness of preventive screening, scheduling of healthcare services, patient access management, and the coordination of resources for elective and emergency services. The methods introduced in class for modeling such contexts include linear and integer programming, stochastic optimization, Markov decision processes, and discrete event simulation. Policy implications will also be discussed.

The course will be delivered in lecture format with assignments, labs and exams. Students will work on a set of healthcare modeling projects during the semester.

Goals

At the end of the class, students should have a firm grasp of how healthcare situations can be modeled using quantitative methods. They should also be aware of the broader context in which healthcare functions.

Prerequisite

MIE 273 (Probability and Statistics). Knowledge of basic optimization methods is desired but not necessary.
Textbooks

This is a relatively new area in operations research, and no textbooks exist yet. Since a basic understanding of operations research is essential to following what is happening in class, I would recommend you use *Introduction to Operations Research*, by Hillier and Lieberman, as your principal textbook. In addition, we will use copies of healthcare papers, slides, and notes provided in class. These additional reference textbooks will also be useful.

3. 

Course Topics

We will cover a wide range of healthcare topics in this class. One of my goals is that we always keep the broader policy context of healthcare in mind as we proceed. To that end, we may see one or two videos of discussions of the current situation in the US healthcare system, and a comparison with other countries. We will broadly cover the following topics in the class:

1. **Introduction**: Understanding the health care system. What is wrong with the United States health care system? Comparison with other countries.

2. **Overview of Operations Research**: Methods such as queuing, discrete event simulation (including modeling with Arena), linear and integer programming.

3. **Planning and Scheduling of Surgical Suites**: Planning of colonoscopy suites; patient appointment scheduling; allocating surgeries to operating rooms.

4. **Primary Care**: Designing primary care physician panels to improve timely access and patient-physician continuity; broader issues in primary care.

5. **Emergency Rooms**: Using discrete event simulation models to reduce length-of-stay in emergency rooms.

6. **Medical decision making**: Using Markov Decision processes to help in various clinical contexts such as screening of prostate cancer, decisions regarding transplanting livers etc.

7. **Global Health Care Problems**: A look at pressing global health problems that may benefit from the use of operations research.
**Requirements**

Grading in the class is based on several aspects, listed below.

1. 4-6 in-class quizzes/in-class activities, (15%). Dates will be informed at least one class prior.
2. 4 healthcare modeling assignments/small projects (40%)
3. Reading healthcare literature and presenting it in class (20%)
4. One final project (25%)

Most of these activities will be done in teams.

**University Policy on Academic Misconduct:**
This course adheres to the UMass – Amherst Policy and Procedures Relating to Academic Integrity. Acts of academic misconduct (e.g., cheating, plagiarism, submitting work prepared by another, etc.) will never be tolerated. Please review these university websites for elaboration: [http://www.umass.edu/dean_students/codeofconduct/acadhonesty/](http://www.umass.edu/dean_students/codeofconduct/acadhonesty/)

**Accessibility Issues:**
If you are a student with a disability requiring adaptations or adjustments to participate in or benefit from class, or if you have a health problem that might require emergency attention, please contact the instructor immediately. Disability documentation is required to arrange for any adaptations. If you have not obtained the necessary documentation, contact Disability Services at (413) 545-0892 or view the policies online at: [http://www.umass.edu/disability/](http://www.umass.edu/disability/) or [http://www.umass.edu/ug_programguide/generalinfo/disabilityservices.html](http://www.umass.edu/ug_programguide/generalinfo/disabilityservices.html)