IE 5080: Topics in Industrial Engineering – Healthcare Analytics
Fall 2023 – Syllabus

Lectures: Tue, 12:20-2:15pm, Lind Hall 302
Instructor: Saumya Sinha (saumya@umn.edu)

Course Description: This course provides an overview of data-driven approaches to make better decisions in healthcare operations and delivery. Students will learn about concepts, metrics, and constraints that are relevant in this domain. The class will focus on a combination of methodology and applications. Methods include decision trees, regression, and Monte Carlo simulations. Applications include public health and policy, healthcare operations, and medical decision-making.

Prerequisites: IE 3521 or STAT 3021 or graduate student

Course Goals and Learning Objectives: On successful completion of the course, students will be:

- Familiar with areas of healthcare decision-making where data-driven approaches and mathematical modeling can be useful.
- Aware of metrics, objectives, and concepts that commonly arise in healthcare decision-making, such as QALYs, hazard ratios, ICER, and effect size.
- Able to identify appropriate modeling approaches and their strengths and limitations for several healthcare applications.

Textbooks: There is no required textbook for the class. We will use the following books as references:

- Operations Research and Health Care: A Handbook of Methods & Applications (Margaret L. Brandeau, Francois Sainfort, William P. Pierskalla, eds., 2004)
- Handbook of Healthcare Operations Management: Methods & Applications (Brian T. Denton, ed., 2013)

e-copies of these books are available through UMN Libraries. Other reference material (book chapters, journal articles, etc.) will be shared through the class Canvas page.

Workload and Assessment

Assessment will be based on weekly homework, short in-class quizzes, and a project; there will be no exams. The contributions of these components towards the final grade will be as follows:

Homework	50%
Quizzes	20 %
Project	30%

Tentative Schedule of Topics

Weeks 1-2	Introduction & overview; Survival analysis
Week 3-4	Regression for risk stratification
Weeks 5-6	Markov models for disease progression
Week 7	Infectious disease modeling
Week 8	Cost-effectiveness analysis and resource allocation for public health interventions
Weeks 9-10	Treatment planning for radiation therapy
Weeks 11-12	Policy design for organ allocation
Week 13-14	Clinical trial design
Week 15	Project presentations