

IE 5400 Healthcare Systems Modeling and Analysis

Syllabus

Spring 2021

Class Hours: 11:45-1:25 Tue & 2:50-4:30 Thu

Class Location: This course will be instructed via NUFlex at International Village (INV) 022

Lecturer: Chun-An Chou

Office Location: 301 SN (**All office hours will be held virtually**)
Office Hours: Tue 1:30-2:30 and Fri 11-12 or by appointment
Email: ch.chou@northeastern.edu

Teaching Assistant: Yilin Yin

Office Location: **All office hours will be held virtually**
Office Hours: TBD
Email: yin.yil@northeastern.edu

Prerequisites:

- Undergraduates: IE 4515 (Minimum Grade of D-)
- Graduates: OR 6205 (Minimum Grade of C-)

Textbook:

- *Analytics and Decision Support in Health Care Operations Management*, 3rd Edition, Yasar A. Ozcan, 2017
- *Healthcare Systems Engineering*, Paul M. Griffin, Harriet B. Nembhard, Christopher J. DeFlitch, Nathaniel D. Bastian, Hyojung Kang, David A. Munoz, 2016

Additional References:

- *Health Care Operations Management, A Systems Perspective*, 2nd Edition, James R. Langabeer II and Jeffrey Helton, 2016
- *Healthcare Operations Management*, 2nd Edition, Daniel B. McLaughlin and John R. Olson, 2012
- *Patient Flow: Reducing Delay in Healthcare Delivery*, 2nd Edition, Randolph Hall (Editor), 2013
- Relevant materials (e.g., research journal articles, book chapters, or news) will be distributed during the semester.

Course Description:

The course focuses on analysis, design, management, and control of health systems and processes that are necessary for healthcare accuracy and efficiency. The key functions of healthcare operations management such as patient and process flows, process improvement, facility layout, staffing and scheduling, capacity planning, and resource allocation are discussed. The applications of industrial engineering and operations research methods such as optimization, data analytics, simulation, and queuing models are discussed through papers and case studies in different care settings (e.g., hospital, emergency department, surgery department, and outpatient clinic) and for disease diagnosis (e.g., infectious and cardiovascular diseases). Spreadsheet and programming tools are utilized to analyze, model and solve such healthcare problems.

Course Objectives:

Students are expected to:

- Understand the healthcare as a service system in various settings (e.g., hospitals, primary care, specialty care)

- Identify key operational problems in healthcare settings
- Apply analytics and decision making methods to improve efficiency and effectiveness of healthcare operations
- Conduct analysis, simulation, scheduling, and more for various healthcare problems

Course Outline:

- Introduction to Healthcare Systems Engineering
- Patient Flows
- Healthcare Predictive Analytics and Data Mining
- Decision Analysis in Healthcare
- Healthcare Logistics (Facility location and Layout)
- Resource Allocation (scheduling and staffing)
- Health Supply Chain and Inventory
- Queuing Models and Capacity Planning & Simulation
- Quality Control and Improvement

Software Tools/Programming Languages:

- MS Excel is essentially required.
- Students will learn Python (or MATLAB), Gurobi, and Arena (or Simulink) for analysis, optimization, and simulation of healthcare problems.

Course Evaluation:

- Assignments (5)	25%
- Projects *	25%
- Quizzes (2) **	30%
- Final Exam**	15%
- Participation & Attendance	5%

* Students are required to form a group of 3 members for the term project.

** Closed book exams. Students are allowed to bring with them one both-sided cheat sheet.

Participation:

Students are required to fully participate in all classes.

Late Submission:

Homework will be assigned on a regular schedule. Late submission of homework will receive penalty. An exception is allowed as you have the result of an officially excused emergency. For two-day delay, its grade will be cut by 50%. Beyond two days past the deadline, the submission will not be accepted.

Makeup Policy:

No makeup opportunity will be given for any missing exam except for documented medical reasons. Students unable to attend classes are responsible for obtaining information regarding announcements and lecture content.

Expectations:

Every student will be expected to maintain a classroom conducive to learning. I like an informal atmosphere, but it must be orderly. Thus, everyone is expected to behave with basic politeness, civility, and respect for others. In particular, talking in class is okay if it's part of a class discussion or with me. Private communications are not, especially during quizzes and tests. Neither are reading extraneous materials, using electronic equipment, or sleeping.

Feedback and Suggestion:

Students' feedback would improve teaching-learning communication and is always welcome at any time. Any concerns about the course should be brought first to my attention.

Recording of Classes:

Classes will be recorded to enable all students to review material covered in synchronous classes. Please contact me if you have any concerns.

Academic Integrity:

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to <http://www.northeastern.edu/osccr/academic-integrity-policy/> to access the full academic integrity policy.

Student Accommodations:

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit <http://www.northeastern.edu/drc/getting-started-with-the-drc/>.

Diversity and Inclusion:

Northeastern University is committed to equal opportunity, affirmative action, diversity and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration and an awareness of global perspectives on social justice. It is my intention that students from all backgrounds and perspectives will be well served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

Please visit <http://www.northeastern.edu/oidi/> for complete information on Diversity and Inclusion.

TITLE IX: Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance. Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty and staff. In case of an emergency, please call 911.

Please visit www.northeastern.edu/titleix for a complete list of reporting options and resources both on- and off-campus