

Models and Methods for Health Systems Engineering

EIN 6905/4905 Section/Class number 14383

Class Periods: MWF Period 7 (1:55 pm -2:45 pm)

Location: FLG 0280

Academic Term: Fall 2019

Course Instructor:

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Guest Lecturers:

Xiang Zhong, PhD (Sept 11)

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Wayne Giang, PhD (Oct 23/25)

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Hongcheng Liu, PhD (Nov 8)

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Boyi Hu, PhD (Oct 21)

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Course Description

Credits: 3; Introduction to the application of industrial engineering and operations research methods to the modeling, analysis and improvement of health care systems. Investigation of lean and six sigma to continuous health care systems improvement. Exploration of common problems of decision making and optimization in health care including scheduling and capacity planning. Examination of health policy, data analysis, and information technology unique to health care.

Course Pre-Requisites

COP 2271 Computer Programming For Engineers, STA 4322 Introduction to Statistics Theory, ESI 4523 Industrial Systems Simulation and *ESI 4312* Operations Research 1 and *ESI 4313* Operations Research 2 with minimum grades of C, or *permission of course instructor*.

Course Objectives

This 3-credit course intends to introduce the basic techniques for the modeling, simulation, analysis and optimization of healthcare delivery systems. You will gain experience in the following aspects:

1. Analyze the context and components of the health care delivery systems.
2. Select and critically evaluate the utility of key industrial engineering and operations research concepts and tools for assessing and modeling health care problems and challenges in health care delivery.
3. Demonstrate the use of industrial engineering techniques in solving selected health care delivery problems.
4. Evaluate the roles of industrial engineers in health care.

Knowing: common terminology, concepts, and practices in various healthcare delivery environments; commonly recognized problems with healthcare delivery systems; various key measures used to assess healthcare system performances; why sustaining and spreading healthcare system performance and practices are difficult, what may be done to improve.

Doing: using basic industrial engineering tools to solve system performance evaluation and decision-making questions in healthcare delivery systems.

Materials and Supply Fees

None

Required Software

- Top Hat account (see fees below)
- You must have a laptop to sign up for this course. The laptop is necessary for the in-class exercises, homework assignments, case studies, and term project.
- For the class you will require access to several Software, including Arena, excel, CPLEX, GUROBI, etc.

Required Textbooks

- Griffin, Paul M., Harriet B. Nembhard, Christopher J. DeFlicht, Nathaniel D. Bastian, Hyojung Kang, and David A. Munoz. *Healthcare systems engineering*. John Wiley & Sons, 2016; ISBN-13: 978-1118971086; ISBN-10: 1118971086
- Additional readings are provided on class web site (UF e-learning) and students are responsible for checking the web page to download the required documents.

Recommended Reading

- Vissers, J., & Beech, R. (2005). *Health operations management: patient flow logistics in health care*. Psychology Press.
- Reid, P. P., Compton, W. D., Grossman, J. H., and Fanjiang, G. Editors, (2005). *Building a Better Delivery System: A New Engineering/Health Care Partnership*. Institute of Medicine, National Academy of Sciences (Available from www.iom.org)
- Denton, B. T. (2013). *Handbook of healthcare operations management: Methods and Applications*. New York: Springer.

Top Hat

- We will be using the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message.
- You can visit the Top Hat Overview (<https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide>) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.
- An email invitation will be sent to you by email, but if don't receive this email, you can register by simply visiting our course website: Unique Course URL
Note: our Course Join Code is 791720
- Top Hat requires a paid subscription, and a full breakdown of all subscription options available can be found here: www.tophat.com/pricing (\$30 for the semester, \$48 for the year; both options include unlimited access for all classes)
- Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

Course Schedule

Dates	Topics	Remark
Aug 21/23	Course Overview and Chapter 1: Healthcare Delivery System	
Aug 26/28/30	Chapter 2: Complexity and Systems in Healthcare	
Sept 4/6	Chapter 3: Patient Flow, Simulation, and Queueing	Case 1: Intro
Sept 9/11/13	Chapter 3 continued, Tour of UFShands Emergency Dept (Date TBD)	
Sept 16/18/20	Chapter 11/12 Healthcare Logistics/Supply Chains	Case 1: Due

Sept 23/25/27	Chapter 4: Healthcare Finance, Tour UFShands Supply Chain (Date TBD)	Case 2: Intro
Sept 30/ Oct 2	Chapter 5: Health Data and Informatics	
Oct 7/9/11	Chapter 6/7: Lean/Six Sigma	Case 2: Due; Project: Intro
Oct 14/16/18	Chapter 8: Reliability/Patient Safety	Project: Abstract
Oct 21/23/25	Human Factors/Ergonomics	
Oct 28/30/Nov 1	Chapter 9: Health Analytics	
Nov 4/6/8	Medical Device Manufacturing, Medical Decision-Making, Data Analytics	
Nov 13/15	Chapter 10: Capacity Management,	Project: Update
Nov 18/20/22	Chapter 13: Infection Control	
Nov 25	Project Day	
Dec 2/4	Healthcare Eng. Career Day, Final Project Presentations	Project: Presentations
Thurs, Dec. 12	Final Exam Period: 10 am - 12 pm (reserved if needed)	

Assignments

Homework and Assignments (40%)

There will be weekly homework or after-class assignments throughout the semester. Material will be drawn from the course textbook or assigned readings from healthcare systems engineering and health service research. Homework is an individual assignment posted on Canvas which should be performed outside of class time where due dates are announced in advance. Other assignments will be small problem-based questions or reading assignments that relate to follow topics from the course lecture.

Case studies (20%)

There will be 2 case study assignments made during the course. Teams of 2-3 students will be selected to lead the discussion of one article and summarize its major content/findings to the class (suggested structure: background, problem and/or research question(s), methodology, analysis, findings, implications of findings, your insights/takeaways, and strengths/weaknesses of the study). The articles should be read critically. In that regard, each team should also present a list of three questions or issues that surfaced while reading the article which can be used as a starting point for a general class-wide discussion.

TopHat in-class participation (20%)

Active in-class participation is required for this course and attendance will be taken via your TopHat submissions in-class. For example, a TopHat question posted in-class for response/discussion may be graded for 50% participation and 50% correctness. TopHat will also be used to note attendance for guest-lecturers. Two attendance dates will be relaxed in this grade and will count as bonus for those who do not require it.

Term project (20%)

There will be one term project for the semester. The term project is to investigate one healthcare systems engineering related topic. Students are encouraged to select problems from their research or work experiences. If necessary, the course instructor can help identify a topic. The team will present findings from the chosen case study about a healthcare organization, healthcare unit, or patient level that used industrial engineering methods, tools, and techniques. Essentially the term project is to identify a real-world case study similar to those previously studied throughout the semester. Students will work in teams of 3-4 students and the outcome of their findings will be documented in a written report and will also be presented at the end of the course. Effort report and peer evaluations will be required.

Attendance Policy

Attendance is required. Students are expected to be aware of all announcements made in class and know all previously covered material when attending the following class.

Late Assignments and Make-Up Policy

Late assignments will be accepted for 24 hours after the due date with a 25% deduction.

In general, there will be no makeup assignments given. However, a student is permitted to make up a missed assignment without penalty if he/she has a conflict between the assignment and a scheduled University-approved activity. A student needing a make-up assignment due to schedule conflicts must notify the instructor at least one week before the day the exam or assignment is scheduled. Excused absences are consistent with university policies and require appropriate documentation.

Academic Integrity

Academic integrity requires that students take credit only for ideas and efforts that are their own. Students must not use unauthorized assistance, materials, information, or study aids in any assessments. Students must not use another person or his or her work as a substitute in taking assessments or completing homework or activities. Students must not take any credit for a team project unless the student has made a fair and substantial contribution to the group effort. Lastly, student must not intentionally or knowingly help or attempt to help another student to commit an act of academic misconduct.

Evaluation of Grades

Assignment	Number	Percentage of Final Grade
Homework, Quizzes, and Class Assignments	TBD	40%
Case Studies	2	20%
Term Project	1	20%
Top Hat Participation	-	20%
<i>Total</i>	-	100%

Grading Policy

Grade	Range	Grade Points
A	93.0 - 100.0	4.00
A-	90.0 - 92.9	3.67
B+	87.0 - 89.9	3.33
B	83.0 - 86.9	3.00
B-	80.0 - 82.9	2.67
C+	77.0 - 79.9	2.33
C	73.0 - 76.9	2.00
C-	70.0 - 72.9	1.67
D+	67.0 - 69.9	1.33
D	63.0 - 66.9	1.00
D-	60.0 - 62.9	0.67

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>
<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will

receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>."

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination.

It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.