

Models and Methods for Health Systems Engineering

EIN 6905/4905 Section/Class number 13236

Class Periods: T2 (8:30 -9:20 am) R2-3 (8:30 -10:25 am)

Location: TUR 2305

Academic Term: Fall 2018

Course Instructor:

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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.

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

- 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.

Course Schedule

Week	Topic	Faculty		Case Study
1-2	Introduction/Overview	XZ	Foundations of Health Systems Engineering, health care delivery systems, stakeholders, global issues in health	Chapter 1/2
3	Lean/Six Sigma	XZ	Process improvement, quality assurance	Chapter 6/7
4-5	Patient flow	XZ	Process mapping and queueing models	Chapter 3
6	Simulation models (discrete-event simulation, system dynamics, and agent-based simulation)	MA	System redesign, health policy, disease spread,	* Chapter 2/ Chapter 13
7	Capacity Management	XZ	Stochastic Programming, Resource scheduling; capacity management	Chapter 10
8	Field trip/Guest lecture		Field trip to local institutions with guided tour (e.g., VA, UF Health)	
9-10	Health Informatics and Data Analytics	XZ/HL	Medical decision making Radiation treatment planning, cancer screening	Chapter 5/9
11	Supply chain/Inventory/Logistics	XZ	Medical devices, pharmaceutical supply chain,	Chapter 11/12
12	Human factors/Ergonomics	BH&WG	Patient safety, Health IT usability	Chapter 8

13	Health Care Financing	XZ	Predictive analytics, precision medicine	Chapter 4
14	Health IT *Thanksgiving Holiday	XZ	Patient portal, remote health, health tracking device	
15	Future directions	XZ	Health care reform, IEers at work	
16	Project presentation	XZ		

Assignments

Homework, Quizzes, and Class Assignments

There will be 8-10 homework, quizzes, and/or 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 performed outside of class time where due dates are announced in advance. Quizzes and class assignments may be given through Canvas following the announcement on the day of class.

Case studies

There will be 3 case study assignments made during the course. Teams of 2-3 students will be selected to lead the discussion of one article and present 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.

Term project

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

In general, there will be no makeup exams or assignments given. However, a student is permitted to make up a missed exam/quiz without penalty if he/she has a conflict between an exam/quiz and a scheduled University-approved activity. Please do not ask for a make-up exam to attend a job interview. A student needing a make-up exam or 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 in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) 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	8-10	50%
Case Studies	3	25%
Term Project	1	25%
<i>Total</i>		<i>100%</i>

Grading Policy

Grade	Range	Grade Points
A	93-100	4.00
A-	90-92	3.67
B+	87-89	3.33
B	83-86	3.00
B-	80-82	2.67
C+	77-79	2.33
C	73-76	2.00
C-	70-72	1.67
D+	67-69	1.33
D	63-66	1.00
D-	60-62	0.67

*The weighted average will be rounded to the nearest integer.

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

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 feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/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.

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:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

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>.