

IE 485 DECISION MAKING IN HEALTH CARE
Spring 2020

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Course Web Page: <https://courses.ie.bilkent.edu.tr/ie485>

Lecture Hours: Tuesday 13:40-15:30 Thursday 15:40-17:30

Office Hours: Tuesday 9:40-10:30

Teaching Assistant: Tuğba Denktas (tugba.denktas@bilkent.edu.tr)

Recommended Textbooks: There is no required textbook for this course. A packet of articles will be provided, and additional readings will be distributed as needed.

Optional Textbooks:

- Drummond MF, O'Brien B, Stoddart GL, Torrance GW. Methods for Evaluation of Health Care Programmes, second edition, Oxford Medical Publications, Oxford 1997.
- Sox HC Jr., Blatt MA, Higgins MC, Marton KI. Medical Decision Making. Butterworth-Heinemann, Boston, 1988.
- Petitti DB. Meta-Analysis, Decision Analysis, and Cost-Effectiveness Analysis. Oxford University Press, New York, 2000.
- Gold MR, Siegel JE, Russel LB, Weinstein MC. Cost-Effectiveness in Health and Medicine , Oxford University Press, New York, 1996.

Course Objectives:

The purpose of this course is to provide an introduction to the use of decision sciences in health-care industry. As the pressures of managed care and increasing health care costs push providers, payers and purchasers of health care to become more efficient, methods for understanding the appropriate basis for how to allocate shrinking health care resources must be understood. In addition to developing a conceptual understanding of medical decision making, the course will develop technical skills in decision analysis including the creation and evaluation of decision trees, the use of sensitivity analysis, using Markov processes, incorporation of specific patient preferences through the use of utility analysis, the use of mathematical modeling as well as multi-criteria decision making tools in health care resource allocation. Examples from the current medical literature will be discussed.

Prerequisite: Basic probability and statistics, basic understanding of mathematical modeling and linear optimization

Homework Assignments: A set of exercises will be assigned and graded.

Quizzes: We already conducted two in-class quizzes. The higher of your two quiz grades will be taken and counted towards 5% of your final grade.

Project: The course project involves either the critical appraisal of an article in the area of medical decision making using one or more of the methods discussed in the class (you will pick the article yourself) or repeating a quantitative analysis (developing and solving a mathematical model of an operations research problem) in the health domain. You will work on the project in groups of 3.

Exams: There will be one comprehensive final exam. The exam will be closed-books and closed notes. The exact date will be announced during the semester. The modus operandi for the final exam will be announced soon. Please check your **e-mail** regularly for announcements.

Grading Policy: The overall score will be computed based on the following scheme:

Homeworks: 35 % (HW1 part a: 2.5%, HW1 part b: 7.5%, HW2: 10%, HW3: 5%, HW4: 10%)

Quizzes: 5 %

Final Exam: 40 %

Project: 15 %

Participation: 5 %

IMPORTANT: You will be eligible to take the final exam only if the weighted summation of your grades from the homeworks, quizzes and project is at least 15 points out of 55. Those who cannot satisfy this condition will get grade FZ.

Tentative Course Outline:

Topic	Suggested Reading (The bold ones are required)
Introduction	1,2,3, 4
Basics of Decision Making in Health Care	5,6
Estimating Benefits, Outcomes and Costs	7,8,9
Time Preferences, Sensitivity Analysis	10,11
Analysis Methods, Decision Trees, Performance of Diagnostic Tests	12,13,14,15
Markov Processes	16,17
Monte-Carlo Simulation	18
OR in Health Care	1, 19
Data Envelopment Analysis	20,21
Equity issues in Health Care Resource Allocation	22,23, 24
Multi-criteria Decision Making Applications in Health Care	25

Week of	Tuesdays	Thursdays
February 3	Lecture (2 hrs)	Lecture (2 hrs)
February 10	Lecture (2 hrs)	Lecture (1 hr)
February 17 (Quiz 1)	Lecture (2 hrs)	Lecture (2 hrs)
February 24	Lecture (2 hrs)	Lecture (2 hrs)
March 2 (Quiz 2)	Lecture (2 hrs)	Lecture (2 hrs)
March 9	Lecture (2 hrs)	Lecture (2 hrs)
March 16	Spring break	No class
March 23	Lecture (2 hrs)	Lecture (2 hrs)
March 30	Lecture (2 hrs)	Lecture (2 hrs)
April 6	Lecture (2 hrs)	Lecture (2 hrs)
April 13	No class	No class
April 20	No class	Holiday
April 27	No class	No class
May 4 (Project Presentations)	Lecture (2 hrs)	Lecture (2 hrs)
May 11 (Project Presentations)	Lecture (2 hrs)	Lecture (1 hr)

READING LIST

1. Rais A., Viana A. "Operations Research in Healthcare: a survey", International Transactions in Operational Research, 2010, 18: 1-31.
2. Drummond Chapter 1
3. Drummond Chapter 2
4. Gold Chapter 1

5. Gold Chapter 2
6. Detsky A, Naglie IG. A clinician's guide to cost effectiveness analysis. *Annals of Internal Medicine* 1990, 113: 147-154
7. Drummond Chapter 6
8. Guyatt GH, Feeny DH, Patrick DL. Measuring health-related quality of life. *Annals of Internal Medicine* 1993, 118: 622-629.
9. Drummond Chapter 4
10. Keeler EB, Cretin S. Discounting of life-saving and other nonmonetary effects. *Management Science* 29: 300-306
11. Drummond Chapter 5
12. Detsky AS, Naglie G, Krahn MD, Naimark D, Redelmeier DA. Primer on medical decision analysis: Part 1- Getting Started. *Medical Decision Making*. 1997;17(2):123-5
13. Detsky AS, Naglie G, Krahn MD, Redelmeier DA, Naimark D. Primer on medical decision analysis: Part 2- Building a Tree. *Medical Decision Making*. 1997;17(2):126-35
14. Naglie G, Krahn MD, Naimark D, Redelmeier DA, Detsky AS. Primer on medical decision analysis: Part 3-Estimating Probabilities and utilities. *Medical Decision Making*. 1997, 17(2):136-41
15. Krahn MD, Naglie G, Naimark D, Redelmeier DA, Detsky AS. Primer on medical decision analysis: Part 4-Analyzing the model and interpreting the results. *Medical Decision Making*. 1997, 17(2):142-51.
16. Sonnenberg FA, Beck JR. Markov models in medical decision making: a practical guide. *Medical Decision Making* 1993, 13(4):322-38
17. Naimark D, Krahn MD, Naglie G, Redelmeier DA, Detsky AS. Primer on medical decision analysis: Part 5- Working with Markov processes. *Medical Decision Making*. 1997,17(2):152-9
18. Roberts MS. Markov process based Monte-Carlo simulation: A tool for modelling complex disease and its applications to the timing of liver transplantation. *Proceedings of the 1992 Winter Simulation Conference*. Swain JJ, Goldsman D, Crane RC, and Wilson JR, eds. 1992: 103-40.
19. Brandeau ML, Sainfort F, Pierskalla W. Health Care Delivery: Current Problems and Future Challenges. In *Operations Research and Health Care: A Handbook of Methods and Applications*, Kluwer Academic Publishers. Brandeau ML, Sainfort F, Pierskalla W eds. 2004:1-14.
20. Al-Shayea A.M., "Measuring hospital's units efficiency: A data envelopment analysis approach", *International Journal of Engineering & Technology IJET-IJENS*, 11(6).
21. Gok M.S.and Sezen B. , Analyzing the Efficiencies of Hospitals: An Application of Data Envelopment Analysis", *Journal of Global Strategic Management*, 2011 December Vol 10, 137-146

22. Stinnett A.A., Paltiel D.A. Mathematical programming for the efficient allocation of health care resources, *Journal of Health Economics*, 15 (1996): 641-653
23. Karsu O., Morton A., "Inequity averse optimization in operational research", *European Journal of Operational Research*, 245 (2), 343-359.
24. Wagstaff A. , QALYs and the equity-efficiency trade-off, *Journal of Health Economics*, 10 (1991): 21-41.
25. Morton A., Aversion to health inequalities in healthcare prioritisation: A multicriteria optimisation perspective, *Journal of Health Economics*, Volume 36, July 2014, Pages 164-173.