ENMG 500 Engineering Management I
Fall 2009, CRN 11332, TTH: 11:00 AM - 12:15 PM, Bechtel 208

Instructor

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Office hours: TTH 12:15 - 1:15 PM

Course Description

Operations Research (OR) is a decision science concerned with optimal allocation of scarce resources. (Check out *www.informs.org* .) OR applications include production planning and scheduling in manufacturing, staffing, pricing, and capacity planning in service industries (e.g. airlines, hotels, retailing), military operations, health care management, and financial asset management, among others. Operations researchers develop mathematical models of real life systems with the objective of enhancing performance. Many OR models come in the form of mathematical programs, which generally aim at finding the best (optimal) value of a real-valued (objective) function of decision variables subject to constraints on these variables. Mathematical programming is further classified into several areas depending on the properties of the objective function and constraints. Among the most popular areas of mathematical programming is *linear programming* (LP) which, as the name implies, assumes a linear universe in terms of objective and constraints. LP popularity stems from its ability to model many real world systems effectively with simple and elegant mathematics. This course will introduce you to the OR methodology of mathematical modeling and to linear programming in particular. Three LP applications will be emphasized: *Transportation problem*, *project management*, and *revenue management* (RM).

Course Objectives

- Understand the OR methodology of mathematical modeling.

- Develop mathematical models for real problems.

- Understand LP and how it is used in mathematical modeling.

- Learn the basic theory behind LP.

- Understand the simplex method, the main tool for solving linear programs.

- Use the simplex method by hand and by computer (with Excel Solver and Tora).

- Perform post-optimality analysis and use it to gain insights into the real system.

- Be familiar with the transportation problem, project management, and RM.

- Solve transportation and project management, and RM problems with LP and other techniques.

Textbook
Taha, H. A. *Operations Research: An Introduction.* 8th Edition. Prentice Hall, 2006.

Additional References

1. Bazaraa M. S., J. J. Jarvis, and H. D. Sherali. *Linear Programming and Network Flows.* 3rd Edition. Wiley, 2004.

2. Hillier, F. S. and G. J. Lieberman. *Introduction to Operations Research.* 8th Edition. McGraw-Hill, 2004.

3. Wagner, H. M. *Principles of Operations Research: With Applications to Managerial Decisions.* 2nd. Prentice Hall, 1975.

4. Winston, W. L. *Operations Research: Applications and Algorithms.* 4th Edition. Duxbury Press, 2003.

Tentative Schedule
Topics will be covered according to the following schedule. The midterm is on the specified date. **This date will not change**. Modeling examples will be covered in parallel with these topics.

- Week 1: Introduction to OR, math modeling, and LP

- Week 2: LP graphical method and graphical motivation for the simplex method

- Week 3: The simplex method in tabular form and general steps of the simplex method

- Week 4: Big-M method and simplex variants (degeneracy, unboundness, alternate optima, infeasibility)

- Week 5: Simplex method in matrix form (revised simplex method).

- Week 6: Duality in LP.

- Week 7: **Midterm Exam on Tuesday 12/08/2009 (evening)**

- Week 8: Economic interpretation of duality

- Week 9: The dual simplex method and sensitivity (post-optimal) analysis

- Week 10: Sensitivity analysis.

- Week 11: The Transportation problem

- Week 13: Project Management with CPM

- Week 14: Project Management with CPM/PERT

- **Final Exam (comprehensive)**

Grading

Midterm Exam	35%
Final Exam	35%
Project	10%
Homework	20%

Homework
Homework problems will be assigned and graded frequently. Students are encouraged to solve the homework problems and to discuss their solution with each other and the instructor. However, each student must *independently* write and submit one assignment. You are *not* required to type the homework. But do *staple it. Doing the homework is the best way to excel in this course.*

Project
The project will involve a case study on applying LP modeling to hotel revenue management. You will develop an effective decision tool for helping a hotel manager deciding on capacity control (i.e., which reservation requests to accept and which ones to reject). The project is intended to give you a taste of realistic OR/LP applications and to enhance your writing skills. The project will be done in two phases in groups of two. You'll submit the first phase, receive feedback from the instructor, and then submit the second phase close to the final exam date. The project deadlines and group assignments will be announced later in the semester. The project should not exceed 8 (well-written) pages. This is a "small" project.

Attendance Policy and Class Management
Attendance will be noted utilizing random sampling.[1] A student is allowed **two** unexcused absences at most. Each additional unexcused absence will lead to losing five points from the final grade. No student will be admitted to class after 15 minutes from the beginning of the lecture. Cell phones, laptops and other gadgets are not allowed in class.

Course Website

http://staff.aub.edu.lb/∼bm05/ENMG500/

Look for class notes, assignments and other class related material there.

University Rules and Regulations
Students are advised to review all relevant university rules and regulations including those related to attendance, cheating, plagiarism, misconduct, and academic integrity, among many others. It shall be expected that strict enforcement of these rules and regulations will be exercised.

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[1]I'll call on one quarter of the students at random in every session. There is a 25% chance that your name is called in a given session. With approximately 28 sessions in the semester, there is approximately a 98.3% chance that your name will be called more than two times in the whole semester. So, the probability of missing all sessions and not getting penalized is 1.7%.