CE 6308: Analytical Models in Transportation

Spring 2015
UTA Civil Engineering Program

Classes:	Tuesdays and Thursdays, 3:30 – 4:50 pm, College of Business 256
MavSpace:	/spmatt/CE6308

Professor:	Dr. Stephen Mattingly
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E-mail:	mattingly@uta.edu
Office:	Nedderman Hall 432
Office Hrs:	Tuesdays and Thursdays, 11-12 and 1-3, and Friday 11-12 or by appointment

Textbooks: **Required:** none

References: Urban Operations Research, Larson and Odoni, Prentice Hall, 1981
(http://web.mit.edu/urban_or_book/www/book/)
Modeling Transport, Ortúzar and Willumsen, 4th Ed.
Urban Transportation Networks, Sheffi, 1985
Any college-level text on Operations Research and Statistics (e.g.
Introduction to Operations Research, Hillier and Lieberman, 10th Ed.;
Statistics and Data Analysis, Tamhane and Dunlop)

Software: Microsoft EXCEL or other spreadsheet

Prerequisite: CE 5337 or consent of instructor

Grades:

Home/Class Assignments	20%
Mid-Terms	44%
Mid-Term Projects/Presentations	20%
Oral Final Project Presentation and Exam	10%
Class Participation for Projects	6%

Course Context: Most advanced transportation research requires the use of various modeling techniques. While expertise with a technique will not likely be achieved without rigorously applying it to model a specific situation, an understanding of the basic premises of these models is essential to transportation careers in planning and logistics.

Course Goals:

1. Develop transportation modeling skills and expertise
2. Increase knowledge of EXCEL functionality
3. Identify applications for different modeling techniques
4. Improve writing and presentation skills
5. Introduce students to transportation research and the critical analysis of journal articles

CE 6308 Schedule

Date	Topic	Text	Assignment Due
Jan 20	Intro, Linear Programming		
Jan 22	Linear Programming		
Jan 27	Linear Programming		
Jan 29	Linear Programming		**1:** (H&L) 4.6.2, 6.3.6, Case 4.3 (online)
Feb 3	Linear Programming		
Feb 5	Linear Programming		**2:** (H&L) 9.2.9, 9.3.3, Case 9.1
Feb 10	Presentations		
Feb 12	Probability Review		
Feb 17	**Midterm 1**		
Feb 19	Queueing		
Feb 24	Queueing		
Feb 26	Queueing		**3:** (H&L) 17.2.3, 17.5.6, Case 17.1
Mar 3	Queueing		
Mar 5	Queueing		**4:** (L&O) 4.1, 4.9, 4.12, 4.15
Mar 10	Spring Break	-	-
Mar 12	Spring Break	-	-
Mar 17	Presentations		
Mar 19	Networks		
Mar 24	**Midterm 2**		
Mar 26	Networks		
Mar 31	Networks		**5:** (H&L) 10.3.2, 10.4.2, Case 10.2
Apr 2	Networks		
Apr 7	Networks		
Apr 9	Discrete Choice		**6:** (L&O) 6.3, 6.4, 6.5, 6.13, 6.14
Apr 14	Presentations		
Apr 16	**Midterm 3**		
Apr 21	Discrete Choice		
Apr 23	Discrete Choice		**7:** (O&W) 7.3, 7.4, 8.1, 8.2
Apr 28	Discrete Choice		
Apr 30	Discrete Choice		
May 5	Presentations		**8:** (S) 12.2, 12.5, 12.9
May 7	**Midterm 4**		
May 14	Oral Final and Project Presentation, 2 – 4:30 or appointment		

* - online = www.mhhe.com/hillier

Homework

The homework should be submitted on the day that it is due. I need the homework turned in by this date so that I can return the solutions to you at the next class. If you are unable to attend class, please submit your homework via fax or e-mail. If the homework is not submitted the maximum score will degrade in the following manner with each deduction associated with class meetings (90%, 70%, 40%).

Mid-terms

The mid-terms will each last one and a half hours. One sheet (front and back) of notes/examples and formulas will be permitted for all "open book" problems.

Presentations

For each general topic, each student will select a paper (TRIS [http://199.79.179.82/sundev/search.cfm] may be used as a starting point for finding a paper) develop a presentation on the paper, and a short 2-3 page summary of the paper, the techniques used, their possible applications to other research, its contribution and your assessment of the paper's approach. The presentation should be about 20 minutes with another 10 minutes for questions. You should be able to answer any questions from the audience as though you performed the research and defend your techniques in a logical manner. After you select a paper, please get it approved by me so that duplication does not occur; furthermore, preference will be given to papers addressing transportation-related problems, but other types of problems may be permitted. All presentation topics may be covered in supplemental assignments or exams.

Expectations

You will be expected to participate in the discussion and classes where presentations are made. Attendance will earn you 4 points/class. Furthermore, an intelligent question (judged solely by myself) will earn you ten points. A weak or solely antagonistic question may earn you a negative five points. Bonus points (up to five) may be awarded for insightful follow-up questions.

Oral Final and Project Presentation

The oral final and project presentation should be scheduled sometime during May 8-15. The final project should be a 3 to 5 page proposal on how you can use one of the topics that this class discusses in your thesis or project research. If you have not selected a topic, please choose a topic that uses one of the modeling techniques. If you would like to use a modeling technique not covered by this class, please contact me to discuss this. You will submit your project (proposal) by 5:00 pm on Friday, May 8. When we meet for the final, you will make a 10-20 minute PowerPoint presentation on your proposal and answer questions over the proposal and any course topic. The total final exam period will not last longer than 55 minutes.

Attendance: At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I allow students to attend class at their own discretion; however, all students should attend all regular presentation days.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located through the doors on both my left and right. After leaving through these doors, the closest exit to the left down the corridor; however, if this exit is blocked, turn right and proceed to the end of the corridor where there is another exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/ses/fao).

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Title IX: The University of Texas at Arlington is committed to upholding U.S. Federal Law "Title IX" such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit www.uta.edu/titleIX.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Academic Integrity: All students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

Instructors may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

Objectives:

1. Be able to solve a linear programming model using the Simplex method
2. Be able to interpret model results and recommend plausible model improvements
3. Be able to list and explain the steps required for an operations research modeling approach
4. Be able to analyze linear programming assumptions for a specific problem
5. Be able to describe linear programming notation and terminology
6. Be able to propose a model to solve a specific problem
7. Be able to find a minimum spanning tree
8. Be able to find a shortest path
9. Be able to describe network terminology
10. Be able to assess model formulation
11. Be able to model a queuing system and calculate key measures
12. Be able to apply the Northwest corner rule and Vogel's method for initializing a transportation problem
13. Be able to compare and contrast linear programming and a transportation problem
14. Be able to solve a Transportation and Transhipment Problem
15. Be able to solve a Chinese Postman Problem
16. Be able to solve a Traveling Salesman Problem
17. **ADD MORE QUEUING OBJECTIVES
18. **ADD MORE NETWORK OBJECTIVES
19. **ADD USER EQUIL vs SYSTEM OPTIMAL