TRAN 650 URBAN SYSTEMS ENGINEERING
Fall 2024

INSTRUCTOR: Lazar Spasovic
Professor, Civil and Environmental
OFFICE: Tiernan Hall (TIER) 272 (within the Transportation Suite, 2nd floor)
Phone: (973) 642-7214 Cell: (551) 208-8560
E-mail: spasovic@njit.edu
OFFICE HOURS: Mondays 4:30 - 5:30 p.m.
Wednesdays 4:30 - 5:30 p.m., and by appointment.
Via e-mail with a maximum response time of 48 hrs.

LECTURES: Distance Learning material posted on Wednesdays

COURSE DESCRIPTION

The course introduces the basic quantitative methods that underline modern urban systems engineering and management science analysis. The basic theory of these methods will be described along with a strong emphasis on the practical applications of these methods. This latter objective is accomplished through the use of various optimization software packages and case studies. In particular, the concept of mathematical programming, stochastic processes, queuing theory, and modern decision analysis will be presented and applied to a variety of problems arising in transportation, civil engineering, and engineering management.

REQUIRED BACKGROUND

Undergraduate Courses in Probability and Statistics, Mathematical Analysis for Technology, and Personal Computers (see Graduate Catalog).

REQUIRED TEXT

Introduction to Operations Research, by Frederick Hillier, 11th edition. (There may be a 2024 edition.)

HOMEWORK ASSIGNMENTS

There will be six homework assignments following the lectures. The homework assignments must be performed independently by each student. Students will submit the homework solutions in NJIT Canvas. The due date for each homework assignment will be one week after the homework posting in NJIT Canvas. The actual submission due date and time will be indicated in the assignment.

CASE STUDIES

Four case studies will be assigned. The class will be divided into groups of 2-3 students each and each group will solve the case studies independently as a team. The students are encouraged to form their own groups. Case study solutions will be due two weeks after the assigned date. Each group will submit a single case study solution report. The cover page will list the names of all students in the group. The solution report can be submitted either in a report format (MS Word or PDF), or a presentation format (PowerPoint or PDF slides).

CLASS PARTICIPATION

Students are encouraged to participate in online discussions using the forums in Canvas. The instructor will create forums for each weekly module. The students should post questions related to lectures or assignments in the forums. The instructor may invite the class to discuss a particular question or problem and students are encouraged to take part in the discussion.

EXAMS

There will be a midterm and a final exam. Each exam will be assigned through Canvas, and it will be an open-book exam. Students will work independently during the exam. Students will have a certain allotted time to solve the problems and submit their solutions. The submission will be through Canvas.

GRADING:		
	Case Studies	15%
	Homework	15%
	Midterm Exam	30%
	Final Exam	30%
	Class Participation	10%

TENTATIVE SCHEDULE OF CLASSES

WEEK	TOPIC	ASSIGNED READING
1	Introduction Linear Programming	Chapters 1-3
2	Graphical Method for LP/Review of Linear Algebra/Simplex Method	HW #1 Assigned
3	Simplex Method/Revised Simplex Method; Transportation Application: Highway Ramp Metering	Chapter 4 HW #2 Assigned
4	Duality Theory/Sensitivity Analysis	Chapters 5-6 Case Study #1 Assigned
5	Network Models Conrail Empty Rail Car Repositioning, a TRF Paper	Chapters 9-10
6	Network Simplex/Transportation Applications	Chapter 9 HW #3 Assigned Case Study #1 Due
7	Integer Programming Traveling Salesman Problem	Chapter12 Case Study #2 Assigned
8	Midterm Exam	
9	Nonlinear Programming	Chapter 13 HW #4 Assigned Case Study #2 Due
10	Review of Basic Probability Theory	Chapter 24 Case Study #3 Assigned
11	Stochastic Processes Queuing Theory and Application Toll Plaza Operation	Chapter 17 and 26 HW #5 Assigned
12	Statistics, Forecasting, Regression Analysis	Chapter 20 (Section 9) Case Study #4 Assigned Case Study #3 Due
13	Decision Analysis	Chapters 16 HW #6 Assigned
14	Transportation/Civil/Management Applications	Case Study #4 Due
15	Final Exam	

I am required by NJIT to include the statements below in the syllabus.

- o *"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.*

- o *Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension, or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"*