Fall 2018

TRAN 650-101: Urban Systems Engineering

Dejan Besenski

JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT New Jersey Institute of Technology

TRAN 650-101 – Urban Systems Engineering Fall 2018

Instructor

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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 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.

GRADING:

Case Studies	20%
Homework	15%
Midterm Exam	30%
Final Exam	30%
Class Participation	5%

REQUIRED BACKGROUND

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

RECOMMENDED TEXT

Wayne L. Winston, "Operations Research: Applications and Algorithms", 4th edition, Duxbury Press, Belmont, California. Or

Frederick S. Hillier, Gerald J. Lieberman. "Introduction to operations research", McGraw-Hill, 2010

GENERAL POLICY

Assignments and exams are to be completed by the due dates. You must have a very good reason for requesting an extension. You must contact the instructor to get an extension for the submission.

HOMEWORK ASSIGNMENTS

There will be six homework assignments following the lectures. Homework assignments must be completed independently by each student. Students will submit the homework solutions in Moodle. The due date for each homework assignment will be a week after the homework posting in Moodle (the submission due date and time will be indicated in Moodle).

MAKEUP POLICY

There will be no makeup for exams unless there are justifiable circumstances.

CODE OF CONDUCT

The NJIT honor code (http://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf) will be upheld throughout the term for this course, and students are expected to abide by it. Any breach of code will result in failure of the course at the least and will be brought to the immediate attention of the Dean of Students leading to suspension or dismissal from the university.

TENTATIVE COURSE OUTLINE

Week	Topic	Assignment
1	Introduction Linear Programming and Graphical Method for LP	Chapters 1-3 HW #1
2	Review of Linear Algebra/Simplex Method Simplex Method/Revised Simplex Method Highway Ramp Metering	Chapters 4 HW #2
3	Duality Theory/Sensitivity Analysis	Chapters 5-6 Case Study #1
4	Network Simplex/Transportation Applications	Chapter 7-8
5	Network Simplex/Transportation Applications	Chapter 8 HW #3 Assigned Case Study #1 Due
6	Integer Programming Traveling Salesman Problem	Chapter 9 Case Study #2 Assigned
7	Midterm Exam	
8	Nonlinear Programming	Chapter 12, HW #4 Assigned Case Study #2 Due
9	Review of Basic Probability Theory	Chapter 11 Case Study #3 Assigned
10	Stochastic Processes Queuing Theory Toll Plaza Operation	Chapter 22 HW #5 Assigned
11	Statistics, Forecasting, Regression Analysis	Chapter 24 (Section 6) Case Study #4 Assigned Case Study #3 Due
12	Decision Analysis	Chapters 13-14 HW #6 Assigned
13	Deterministic Dynamic Programming	Chapter 18
14	Probabilistic Dynamic Programming Case Study 4 Presentations	Chapter 19
15	Final Exam	