CIE/IE 500 Special Topics - Transportation System Modeling and Control
(Spring 2013)
Time: 3:30-4:50pm T/Th
Place: Talbert 103, North Campus
Web: Please use UBlearns to assess all course information

INSTRUCTOR
Dr. Qing He
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Phone: 716.645.3470
Office hours: Just stop by at Bell 313, or by email appointment

COURSE DESCRIPTION
The objective of this course is to introduce popular models and control methods for management and operation problems in modern urban transportation systems. The course will cover various modeling and simulation approaches used in studying dynamics and control in a transportation network, including macroscopic and microscopic traffic models, traffic signal control and optimization, user equilibrium and system optimum, incident management, railway operations and modeling, and state-of-art traffic simulation tools.

COURSE OBJECTIVE
By the end of this course, students should be able to:
- Understand different types of transportation system models.
- Analyze and control transportation network by various modeling techniques.
- Apply proper analytical tools and models to solve practical transportation problems.

PREREQUISITES
- Engineering background

REQUIRED TEXTBOOK
- None, course related materials will be distributed on UBlearns.

ADDITONAL REFERENCES
- (Transportation modeling) Y. Sheffi, Urban Transportation Networks: Equilibrium Analysis with Mathematical Programming Methods, Prentice-Hall, 1985

REQUIRED SOFTWARE SKILLS
- Any programming tool: Matlab, or R, or Python, or other tools

COURSE OUTLINE (SUBJECT TO CHANGE)
1. Basics in transportation
   a) Traffic characteristics
   b) Fundamental diagram and space-time diagram
   c) Deterministic queuing diagram
2. Transportation modeling:
a) User equilibrium  
b) System optimum

3. Traffic simulation models
a) Macroscopic models: Store-and-Forward Model, Cell Transmission Model,  
b) Microscopic models: Car following models, Cellular Automata  
c) Mesoscopic models: Dynasmart-P

4. Transportation system operations and management
a) Ramp metering control  
b) Traffic signal control  
c) Congestion pricing  
d) Incident management  
e) Railway operations

COURSE GRADING
- 25% Homework Assignments (approximate 5 assignments)  
- 40% Exams (2 mid-term, 20% each, no final exam)  
- 35% Project

The student’s final weighted grade depends on both individual performance and class rank. Any student will obtain a minimal letter grade, if the course average fits in the slot shown as below: A (90); A- (86); B+ (82); B (78); B- (74); C+ (70); C (66); C- (62); D+ (58); D (54); and F (less than 54). However, the instructor holds the right to lower the grade cutoffs for particular grades according to the entire class performance. Note that the instructor will not raise the cutoffs in any circumstance.

POLICY
- Homework: Homework is individual assignment! Plagiarism and/or the copying/duplication of another student's homework will result in zero scores for the homework for all individuals involved. Homework will be fully accepted late only if prior approval is given by the instructor. Otherwise late homework will be downgraded by 25% per day.  
- Exams: Mid-term exams will be closed textbook and closed notes tests, though a two-side cheat sheet is allowed. A make-up exam will only be given under extreme circumstances, and in any case, students should ask for the course instructor's permission prior to the test. Cheating in the exam will result in failure in the course and the cheating case will be filed and reported to the University.  
- Projects: Term project can be done in a team with no more than 3 students. Team members will receive the same grade. The topics of term project can be selected based on your own research problems, or given by instructors. Every project proposal needs to be approved by instructor in advance. Additional project instructions will be distributed in the class. Each team will need to present the project in the last week of class.  
- The UB Academic Integrity Policies will be followed. Visit http://academicintegrity.buffalo.edu/