

Fall 2011

Department of Civil and Environmental Engineering

CEE 509 Transportation Systems Analysis

Engineering Science Credits: 2

Engineering Design Credits: 1

Required or Elective course: Elective

Catalog Description:

This course focuses on the theory and application of transportation systems analysis (TSA) within the context of the metropolitan transportation planning and decision-making process currently in place in the U.S. An emphasis is placed on the use of TSA perspectives, principles, concepts, and methods in selected components of the process including the formulation of conceptual metropolitan transportation decision-making models; transportation data management; transportation demand estimating; urban activity analysis; transportation supply and performance analysis; transportation systems and project evaluation; and transportation investment programming and priority setting. A special effort is made to review the merits, challenges, and limitations of using TSA perspectives and concepts in the metropolitan transportation planning process and its various components.

Pre-requisites: CEE 310 or equivalent

Credit Hours: 3

Office Hours: TuTh 11:30-12:00, 12:30-2:30 (no appointments needed)

Course Website: <https://spark.oit.umass.edu/webct/logon/2467711245041>

Textbook(s):

- C** Cascetta, Ennio. *Transportation Systems Analysis: Models and Applications*, Second Edition, Springer, 2009. (Available as an ebook from the UMass library website. A print copy can be ordered from the website for \$24.95.)
- G** Gomez-Ibanez, Jose, Tye, William B. and Winston, Clifford (editors). *Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer*, Brookings Institution Press, 1999. ISBN 0-8157-3182-5 (Available in UMass library; Ebook available from the UMass library website)
- B** Ben-Akiva, Moshe and Lerman, Steven L. *Discrete Choice Analysis: Theory and Applications to Travel Demand*, MIT Press, 1985. (The required pages will be put on

electronic reserve through the UMass library. The URL will be available on SPARK. Password required.)

Attendance policy:

Students are expected to attend each class and **arrive on time**. Each student is responsible for the material covered and for all assignments made in class whether or not he or she attends the class. ***Attendance will be considered in assigning final grades.***

Students are responsible for taking exams at the scheduled times, to know the location that the exam will be given, and to make alternative arrangements in advance if a legitimate reason exists for not being able to take an exam. In considering whether to grant an excuse for an absence caused by illness or other extenuating non-academic reasons, faculty have the right to require formal, written documentation, within the limits of the health care provider's policy. (See Excuses for Health Reasons, under Administrative Policies & Procedures). **No make-up exams** will be given for un-excused absences.

State law requires that the University excuse any student who is unable to attend classes or participate in any examination or study because of religious observance. Students have the right to make up examinations or study that they miss because of religious observance without any adverse or prejudicial effects. Therefore, students have an obligation to inform their instructor, in advance, of the days on which they may be absent for religious reasons. Students should inform their instructor in writing of the days they will be absent as early in the semester as possible and always prior to the day(s) on which they will be absent for religious reasons.

Academic honesty policy:

The student will be required to use published and unpublished literature in preparing class assignments and laboratory reports. Literature includes books, reports, papers, articles, speeches/oral presentations, interviews, and Internet Web Sites. **Plagiarism in any form will not be tolerated and will result in a grade of zero.** Plagiarism includes, but is not limited to, the following:

- Using thoughts or words of others and representing them as your own, including copying text from other sources without attribution. Direct quotation of other source material may be used if it is highlighted by quotation marks and/or italic font, and the source is acknowledged. Plagiarism also includes the description of concepts or ideas which you have taken from other sources, not copied word for word, but for which you do not attribute the source.
- Copying of papers prepared by other students, regardless of the source.
- Submitting a paper, and representing it as your own work, which was prepared by others.
- Downloading text and figures from an Internet Web Site which you do not attribute the source.

The student will be instructed on methods for proper referencing of cited literature using Transportation Research Board (TRB) format (see TRB Web Site).

Assessment Methods (grading and instructor feedback):

Assignments: 30% (Assignments have non-equal lengths and thus weights)
Quizzes: 40% (in-class, open book/open notes)
Term Project: 30%

Course Performance Indicators (CPI's):

1. I can identify the demand and supply components of a transportation system.
2. I can identify the critical issues of the US transportation system.
3. I can apply the Logit model to predict travelers' mode choices.
4. I can understand the four-step travel demand forecasting models and interpret sensitivity analysis results from policy changes.
5. I can solve a user equilibrium problem in a transportation network.
6. I can solve a system optimal problem in a transportation network.
7. I can use the benefit-cost ratio method to select a transportation project.
8. I can work with teammates and present a course project in both written and oral formats

Program Outcomes from ABET Criterion 3– (a-k) addressed in the course:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (e) an ability to identify, formulate, and solve engineering problems
- (g) an ability to communicate effectively
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues

Mapping of Course Performance Indicators to Program Outcomes:

<u>CPI's</u>	<u>ABET (a-k) Mappings</u>
1	e
2	g,i,j
3	a,e
4	a,e
5	a,e
6	a,e
7	a,e
8	a,e,g,i,j

Class Schedule

No.	Date		Topic	Reading	Assignment		Term Project
					Out	In	
Introductory Lectures							
1	Sep	6	Modeling Transportation Systems	C1	1		
Demand Analysis							
2		8	Consumer Theory I	G11-13, 39-43, 142-145			
3		13	Consumer Theory II				
4		15	Discrete Choice Analysis: Framework	C3.1,3.2 B4, C3.7,8.3	2	1	
5		20	DCA: RUM and Model Specification				
6		22	DCA III: Estimation and Validation				Phase I Out
7		27	DCA IV: Prediction				Phase I In
8		29	Trip Generation and Distribution	C4.1,4.2, 4.3,4.6	3	2	
9	Oct	4	Travel Demand Forecasting Case Study				
10		6	Critique of Trip-Based Modeling				
11		13	Activity-Based Modeling	Handout		3	
Network Equilibrium Analysis							
12		18	Network Equilibrium	C5.1,5.2	4		
13		20	Quiz 1				
14		25	Uncongested Networks	C5.3			
15		27	User Equilibrium I	C5.4.1-5			
16	Nov	1	Class Cancelled (Snowstorm)			4	
17		3	User Equilibrium II			5	
18		8	Algorithms to Solve UE				
19		10	System Optimum	C5.4.6	6		
20		15	No Class (INFORMS)			5	
21		17	Network Congestion Pricing I	G6	7		
22		22	Congestion Pricing II			6	Phase III Out
Project Evaluation							
23		29	Basics of Engineering Economy Benefit/Cost Analysis	C10.1,10 .2,10.3.1 ,10.3.2		7	
24	Dec	1	Multi-criteria Analysis	C10.3.3			
25		6	Term Project Presentations				
26		8	Quiz 2				

Term Project: Phase I – Teams; Phase II – Two group assignments as part of regular assignment; Phase III – Alternative Evaluations (final report due Dec. 20)

Prepared by: Song Gao

Date: 9/2/2011 (revised based on actual class progression on Nov 22, 2011)