Fall 2012

Department of Civil and Environmental Engineering

University of Massachusetts Amherst

CEE 509 Transportation Systems Analysis

Elab 306, TuTh 9:30-10:45

Instructor:
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Teaching Assistant:
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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

Course Website: https://moodle.umass.edu/course/view.php?id=1903

Textbook(s):

S Sheffi, Yosef. *Urban Transportation Networks: Equilibrium Analysis with Mathematical Programming Methods*, Prentice-Hall, 1985, ISBN-13: 978-0139397295. (Available for download at http://web.mit.edu/sheffi/www/selectedMedia/sheffi_urban_trans_networks.pdf)

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-13: 978-0815731818 (Ebook available from the UMass library website: http://site.ebrary.com/lib/umassa/docDetail.action?docID=10063824)

B Ben-Akiva, Moshe and Lerman, Steven L. *Discrete Choice Analysis: Theory and Applications to Travel Demand*, MIT Press, 1985. ISBN-13: 978-0262022170 (The required pages are on electronic reserve: http://ereserves.library.umass.edu/)

M Meyer, Michael D. and Eric J. Miller. *Urban Transportation Planning*, Second Edition, McGraw Hill, 2001. ISBN-13: 978-0071200004 (The required pages are on electronic reserve: http://ereserves.library.umass.edu/)

DN de Neufville, Richard. *Applied Systems Analysis: Engineering Planning and Technology Management*, McGraw-Hill, 1990, ISBN-13: 978-0070163720. (Available online at http://ardent.mit.edu/real_options/ASA_Text/asa_Text_index.html)

Attendance policy: All students are expected to attend all classes and to be at class on time. Poor attendance will negatively affect your grade.

Academic honesty policy: The UMass Academic Honesty Policy applies and can be found at http://www.umass.edu/dean_students/codeofconduct/acadhonesty/. The policy covers plagiarism, cheating, fabrication, and facilitating dishonesty.

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%

Class Schedule

No.	Date		Topic	Reading	Assignment		Term Project
					Out	In	
Introductory Lectures							
1	Sep	4	Modeling Transportation Systems	S1.1,1.2	1		
Demand Analysis							
2		6	Consumer Theory I	G11-13, 39-43, 142-145			
3		11	Consumer Theory II				
4		13	Statistics Overview	Handout			
5		18	Discrete Choice Analysis: RUM and Model Specification	B4		1	
6		20	DCA III: Estimation and Validation		2		Phase I Out
7		25	DCA IV: Prediction				Phase I In
8		27	Trip Generation and Distribution	M5.4	3		
9	Oct	2	Travel Demand Forecasting Case Study			2	
10		4	Critique of Trip-Based Modeling				
11		11	Activity-Based Modeling	Handout		3	
Network Equilibrium Analysis							
12		16	No Class (INFORMS)				
13		18	**Quiz 1**				
14		23	Introduction	S1.3	4		
15		25	Uncongested Networks	Handout			
16		30	User Equilibrium I	S3	5		
17	Nov	1	User Equilibrium II			4	
18		6	Algorithms to Solve UE	S5.2			
19		8	System Optimum I	S3	6	5	
20		13	System Optimum II				
21		15	Network Congestion Pricing I	G6	7		
22		20	Congestion Pricing II			6	Phase III Out
Project Evaluation							
23		27	Basics of Engineering Economy	DN10, 11, 12		7	
24		29	Transportation Project Evaluation	M8			
25	Dec	4	Term Project Presentations				
26		6	**Quiz 2**				

Term Project: Phase I – Teams; Phase II – Two group assignments as part of regular assignments; Phase III – Alternative Evaluations (final report due Dec. 18)

Prepared by: Song Gao

Date: 8/16/2012

Revised 9/19/2012 according to actual progress

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:

CPI's	ABET (a-k) Mappings
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