CP 6321: Transportation Planning Methods and Investment Decisions

REVISED September 11, 2013

CLASS SYLLABUS

Georgia Institute of Technology
Fall 2013

Time: Monday/Wednesday 9:05-10:25 am
Room: Skiles 156

Instructor: Timothy F. Welch
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Office Hours: Wednesday 2:00 PM – 4:00 PM
or by appointment (twelch.com)

Introduction to the Course

This course takes an applied approach to the study of transportation planning concepts, relevant investment decisions and analytical methods. The course is composed of two components. The first part focuses on the economic and financial foundations of transportation. This includes the fundamental concepts the drive transportation demand, influence costs and supply, and effect investment decisions. The course will deconstruct the complex and sometimes adverse relationships between public/private investment and highway/transit provision. These concepts provide students with the theoretical underpinning necessary to understand how transportation investment decisions are made.

The second part of this course takes a hands-on approach to transportation planning methods. Students are introduced to travel demand modeling. The course will delve into the common 4-step transportation demand model, the basic foundation for much of the transportation demand analysis that takes place in the U.S. Students will learn the mathematical underpinnings of each of the four steps and, with the aid of spreadsheets, use what they learn to conduct a simple alternatives analysis comparing two methods of organizing transit service.

This course will combine principles of economics, management, engineering, operations research, and public policy to present a comprehensive view of how analysis methods and social political contexts can lead to various observed transportation investment decisions.

Course Prerequisites: City planning students are expected to have completed CP6311. A basic understanding of microeconomics, algebra, and statistics is highly recommended.

Student Learning Objectives

The main objective of this course is for students to master important theories and concepts in economics and finance, and travel demand analysis and apply them to understand various issues in transportation policy and planning.

After successfully completing this course, students will:

- Understand important theories and concepts in economics, political economy, and finance that guide the analysis of transportation systems,
- Be familiar with the goals and assumptions that underlie debates about transportation finance and policy,
- Discuss and explain issues and arguments from an economic perspective
- Apply acquired knowledge to examine various transportation issues,
- Understand the fundamental concept and application of four step travel demand modeling and
- Make policy and planning recommendations based on solid economic arguments.

Required Books:

Meyer, John Robert, José A. Gómez-Ibáñez, W. William B. Tye, and Clifford Winston, eds. *Essays in transportation economics and policy: a handbook in honor of John R. Meyer*. Brookings Institution Press, 1999. [ISBN: 0815731825]

Optional Books

Roth, Gabriel. *Roads in a market economy*. 1996. [ISBN: 1840145234]

Katz, Bruce, and Robert Puentes, eds. *Taking the high road: a metropolitan agenda for transportation reform*. Brookings Institution Press, 2005. [ISBN: 0815748272]

Readings and Attendance

Students are expected to attend classes regularly and to complete all reading assignments before class. All materials that are not from the required text will be available electronically and are marked: [T-Square].

Lectures, Class Discussions and Exercises

The lectures, discussions, and exercises will review and extend the material covered in the readings. Students are expected to be active participants in these discussions and exercises, and to integrate information from lectures, readings, discussions, and exercises into their assignments.

Warning: lectures are designed for active class discussion. Please come to class prepared to

participate. Without class conversation the lectures will be quite dull.

Course Evaluation:

Students will be graded in three areas:

- *General class participation* (including attendance; participation in discussions, 10 points). To receive the full 10 points, students must be in class and actively participating in class discussion.

- *3 assignments* (worth 15 points each for a total of 45 points). Assignments will be handed out in class and are generally due within two weeks. Late work will be marked down 10% per day and will not be accepted after 10 days.

- *Research paper and presentation* (worth 5 points for presentation, 40 points for paper)

Final grades for the class will be calculated by summing the scores from each activity.

There will be no final exam for the course.

Grading will be determined as follows:

Attendance, Class Participation, and Discussion Leading	10 percent
Homework/Written Assignments/Modeling Exercises	45 percent
Term paper (including a prospectus and a presentation)	45 percent
Total	100 percent

Honor Code:

All students should be knowledgeable of the Georgia Institute of Technology Academic Honor Code. In general, you are encouraged to discuss assignments with your classmates. But the final writing must be done independently. The work produced for the assignment should be original, not work recycled from other courses.

Class Schedule:

Course Part 1: Transportation Investment Decisions

Week 1: Course Overview

TOPIC: Course Introductions, Syllabus and Requirements

Required Readings:

Kain, John F. "The Urban Transportation Problem", Chapter 11 in Gomez- Ibanez et al. **Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer**, The Brookings Institution, 1999.

Small, Kenneth and Jose A. Gomez-Ibanez. "Chapter 46: Urban Transportation," in *Handbook of and Urban Economics*. *Volume 3 Applied Urban Economics*, edited by Paul Cheshire and Edwin S. Mills, North-Holland, New York, 1999, pp.1936-1999. [T-Square]

Transportation Research Board. *Critical Issues in Transportation*, Washington, DC: TRB, 2009 update. http://onlinepubs.trb.org/Onlinepubs/general/CriticalIssues09.pdf

Supplemental Readings:

Roth, Gabriel. Roads in a Market Economy, Chapter 1 (Introduction). Gabriel Roth, 1996. [T-Square]

Taylor, Brian D. 2006. "Putting a Price on Mobility: Cars and Contradictions in Planning," Longer View, *Journal of the American Planning Association*, 72(3): 279-284. [T-Square]

Week 2: Transportation Demand

Required Readings:

Small, K. and Winston, C. "The Demand for Transportation", Ch. 2 in Gomez- Ibanez et al. **Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer**, The Brookings Institution, 1999, pp. 11-28, 39-49.

Meyer, Michael D., and Eric Miller, (2001). "Chapter 5: Demand Analysis," Urban Transportation Planning, 2nd edition, pages 256-270, 290-294 and 297-303. [T-Square]

[Assignment 1 Distributed]

Week 3: Transportation Supply

Required Readings:

Bell, G. J., D.A. Blackledge, and P.J. Brown, (1983). "3: The Supply of Transport," The Economics and Planning of Transport. William Heinemann Ltd., London, pp. 37-68. [T-Square]

Braeutigam, Ronald R., (1999). "Learning about Transportation Costs," Chapter 3 in Gomez- Ibanez et al. **Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer**, The Brookings Institution, 1999, pages 57-71 & 74-93 of 57-97.

Delucchi, Mark A. "The Annualized Social Cost of Motor-Vehicle Use in the U.S. Based on 1990-1991 Data: Summary of Theory, Data, Methods, and Results," *The Full Costs and Benefits of Transportation*, Greene, David L., Donald W. Jones, and Mark A. Delucchi. Springer, New York. Pages: 27-55 of 27-68. 199 (http://www.fhwa.dot.gov/scalds/delucchi.pdf)

Supplemental Readings:

Greene, David L. and Donald W. Jones. 1997. "The Full Costs and Benefits of Transportation: Conceptual and Theoretical Issues," in Greene, David L., Donald W. Jones, and Mark A. Delucchi, Editors, The Full Costs and Benefits of Transportation: Contributions to Theory, Method and Measurement. Heidelberg, Germany: Springer-Verlag Berlin. Pages 1-26. [T-Square]

Berechman, J. Public Transit Economics and Deregulation Policy, North- Holland, 1993, Ch. 5 (pp. 111-138), Ch. 6 (pp. 145-161; 168-178). [T-Square]

Week 4: Road Pricing (I)

TOPIC: Congestion Pricing

Required Readings:

Gomez-Ibanez, Jose A., (1999). "Pricing," Chapter 4 in Gomez- Ibanez et al. **Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer**, The Brookings Institution, 1999, pages 99-111, 119-123 & 133-134 of 99-136

Arnott, Richard and Kenneth A. Small. "The Economics of Traffic Congestion," *American Scientist*, 82 (Sept./Oct.). Pages: 446-455. 1994. [T-Square]

Congressional Budget Office. Using Pricing to Reduce Traffic Congestion, March 2009. [T-Square]

Week 5: Road Pricing (II)

TOPIC: Truck Fees and Tolls

Required Readings:

Gomez-Ibanez, Jose A., (1999). "Pricing," Chapter 4 in Gomez- Ibanez et al. **Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer**, The Brookings Institution, 1999, pages 123-127 of 99-136.

Holguin-Veras, Jose , Mecit Cetin, and Shuwen Xia (2006). "A Comparative Analysis of US Toll Policy," *Transportation Research Part A, Policy and Research*, Vol. 40, pages 852-871. [T-Square]

Supplemental Readings:

Kenneth A. Small, Clifford Winston, Carol A. Eva, (1989). *Road Work: A New Highway Pricing and Investment Policy*, pages 37-68. [T-Square]

Forkenbrock, David J. 1999. "External Costs of Intercity Truck Freight Transportation." *Transportation Research, Part A*, 33A(7/8): 505-526. [T-Square]

Week 6: Transit Pricing

Required Readings:

Marginal Cost Pricing for Transit Service, Cost Allocation Models, Fare Elasticity, Transit Fare Policy Gomez-Ibanez, Jose A., (1999). "Pricing," Chapter 4 in ***Essays in transportation economics and policy***, pages 111-119 of 99-136.

Wachs, Martin. 1989. U.S. Transit Subsidy Policy: In Need of Reform. Science 244:1545-1549. [T-Square]

Supplemental Readings:

Litman, Todd. 2004. Transit Price Elasticities and Cross-Elasticities. Journal of Public Transportation, Vol. 7, No. 2: 37-57. [T-Square]

Cervero, Robert, "Transit pricing research: A review and synthesis," Transportation, vol.17, pp.117-139, 1990. [T-Square]

Week 7: Transportation Investments and Economic Development

Required Readings:

Bollinger, Christopher R., and Keith R. Ihlanfeldt. "The impact of rapid rail transit on economic development: the case of Atlanta's MARTA." *Journal of Urban Economics* 42, no. 2 (1997): 179-204. [T-Square]

Cervero, Robert. "Rail transit and joint development: Land market impacts in Washington, DC and Atlanta." *Journal of the American Planning Association* 60, no. 1 (1994): 83-94. [T-Square]

Rephann, Terance J. "Highway investment and regional economic development: decision methods and empirical foundations." *Urban Studies* 30, no. 2 (1993): 437-450. [T-Square]

Supplemental Readings:

Brookings Institution, Metropolitan Policy Program et al., "Value Capture and Tax-Increment Financing Options for Streetcar Construction" (Brookings, 2009). Available at: http://www.reconnectingamerica.org/assets/Uploads/brookingsvalueaddedtif2009.pdf.

Debrezion, Ghebreegziabiher, Eric Pels, and Piet Rietveld. "The Impact of railway stations on residential and commercial property value: A meta-analysis." *The Journal of Real Estate Finance and Economics* 35, no. 2 (2007): 161-80. [T-Square]

Drennan, Matthew and Charles Brecher. "Can public transportation increase economic efficiency?" *Access* 40 (2012): 29-33. Available at: http://www.uctc.net/access/40/access40_transiteconomy.shtml

Week 8: Highway Financing (Part 1)

TOPIC A: Introduction

Required Readings:

Taylor, Brian D. 2004. "The Geography of Urban Transportation Finance," in *the Geography of Urban Transportation*. Pages 294-331. [T-Square]

TOPIC B: Highway Financing (Where does the money come from?)

Required Readings:

Burbank, Cynthia J and Nick Nigro. 2011. "Primer on Federal Surface Transportation Authorization and the Highway Trust Fund." Pew Center on Global Climate Change, February 2011. [T-Square]

Brown, Jeffrey. 2001. "Reconsider the Gas Tax: Paying for What You Get". *Access*, No. 19:10- 15. [T-Square]

Supplemental Readings:

Wachs, Martin. 2003. A Dozen Reasons for Raising Gasoline Taxes, UCB-ITSRR- 2003-1, 2003. 11 pages. [T-Square]

Federal Highway Administration, Office of Policy Development (1998). "Primer: Highway Trust Fund," 12 pages. Available at: http://www.fhwa.dot.gov/aap/PRIMER98.PDF

Week 9: Highway Financing (Part 2)

TOPIC: Highway Financing (Where does the money go?)

Required Readings:

Kirk, Robert S. "The Donor-Donee State Issue in Highway Finance." *Washington, DC: Congressional Research Service* (2011). [T-Square]

Small, Kenneth A. "Using the revenues from congestion pricing." Transportation 19, no. 4 (1992): 359-381. [T-Square]

Supplemental Readings:

Litman, Todd (2007). Evaluating Transportation Equity: Guidance For Incorporating Distributional Impacts in Transportation Planning, Victoria Transport Policy Institute, pages 2-16 of 46 pages. Available at: http://www.vtpi.org/equity.pdf

Hodge, David C. (1995). "My Fair Share: Equity Issues in Urban Transportation," *The Geography of Urban Transportation*, **2nd Edition**, Susan Hanson, editor. New York: Guilford Press. Pages 359-375. [T-Square]

Deka, Devajyoti (2004). "Social and Environmental Justice Issues" in *The Geography of Urban Transportation*. Pages 332-335 and 338-347 of 332-355. [T-Square]

Gillen, David 1997. "Efficient Use and Provision of Transportation Infrastructure with Imperfect Pricing: Second Best Rules," in Greene, David L., Donald W. Jones, and Mark A. Delucchi, Editors, The Full Costs and Benefits of Transportation: Contributions to Theory, Method and Measurement. Heidelberg, Germany: Springer-Verlag Berlin. Pages 193-218. [T-Square]

Week 10: Transit Financing and Private Funds

Required Readings:

Lem, Lewison Lee. 1997. "Dividing the Federal Pie," Access, 10: 10-14. [T-Square]

Transit Financing: A financially Distressed Industry: Understanding Public Transit Subsidies. Beimborn, Edward and Robert Puentes (2005). Highways and Transit: Leveling the Playing Field in Federal Transportation Policy, in *Taking the High Road*, pp. 257-286. [T-Square]

Roth, G. Roads in a Market Economy, Ashgate Publishing Limited, 1996, [T-Square]

- Chap. 5 – Commercial Investment in Roads
- Chap. 7 – Private Provision of Public Roads
  - 7.6 – United States
  - 7.9 – Objection to the private provision of roads

Supplemental Readings:

Roth, G. Roads in a Market Economy, Ashgate Publishing Limited, 1996, 138-206., Chap. 6 – Objections to Commercial Provision. [T-Square]

Hess, Daniel B. and Peter A. Lombardi (2005). "Governmental Subsidies for Public Transit: History, Current Issues, and Recent Evidence," *Public Works Management and Policy*, Vol. 10, No. 4. Available at: http://www.ap.buffalo.edu/pdfs/planning/hess/Governmental_Subsidies.pdf

Friedman, M. and Boorstin, D. "How to plan and pay for the safe and adequate highways we need", Epilogue in Roth, G. *Roads in a Market Economy*, Ashgate Publishing Limited, 1996. [T-Square]

Iseki, Hiroyuki, Kansai Uchida, and Brian D. Taylor. 2009-forthcoming. *Are Public-Private Partnerships a Good Choice for U.S. Highways? A Literature Review*, 38 pages. [T-Square]

Course Part 2: Transportation Planning Methods

Week 11: Introduction to Travel Demand Modeling

Required Readings:

de Dios Ortúzar, Juan, and Luis G. Willumsen. *Modelling transport*. Vol. 7. Chichester:: Wiley, 2001. Pages 1-20 [T-Square]

ARC, Atlanta Transportation Demand Model Documentation (http://www.atlantaregional.com/File%20Library/Transportation/Travel%20Demand%20Model/tp_arcmodeldocumentation_022212.pdf)

Week 12: Trip Generation

Trip generation:
- Trip attraction: concept and models
- Productions and Attractions PSANDAS tables

Trip table notation
The trip distribution challenge

[Assignment 2 Distributed]

Week 13: Trip Distribution

Trip distribution: the singly constrained gravity model
Friction factors

Required Readings:

K. Haynes and S. Fotheringham. 1984. *Gravity and Spatial Interaction Models*. Sage Publications. Pp. 1-28, 40-47. [T-Square]

Ronald L. Mitchelson and James O. Wheeler. 1995. "Analysis of Aggregate Flows: The Atlanta Case." in Susan Hanson, ed., *The Geography of Urban Transportation, Second Edition*. New York: Guilford. Pp. 129-165. [T-Square]

Week 14: Mode Choice

Topic: Modal share analysis:
- Discrete choice models

- The multinomial logit model
- The nested logit model
    - Issues in specification and aggregation

[Assignment 3 Distributed]

Week 15: Trip Assignment and Other Models

The 4th Step: Trip assignment
- Shortest Path Algorithms
- User Equilibrium

Week 16: Final Paper Presentation

Students will give a 5-minute presentation on their research paper.

CP6321 - Transportation Planning Methods and Investment Decisions
Course Calendar

Week	Lecture 1	Lecture 2	Readings	Assignments
1	8/19: Introductions and Course Overview	8/21: Thinking about transportation investments	ETEP: Ch. 11 Small et al: Ch. 46 TRB Critical Issues	
2	8/26: Transportation Demand	8/28: Transportation Demand In-class Exercise	ETEP: Ch. 1 Meyer and Miller: Ch. 5	
3	**9/2: Labor Day** **No Class**	9/4: Transportation Supply	Bell et al: p. 37-68 ETEP: Ch. 3 Greene and Jones: p. 1-26	**Assignment 1: Elasticities** **due 9/06 by 5 pm**
4	9/9: Road Pricing	9/11: Congestion Pricing	ETEP: Ch. 4 Arnot and Small: p. 446-455 CBO: Pricing and Congestion	
5	9/16: Truck Fees and Tolls	***9/18: Truck Fees and Tolls***	ETEP: Ch. 4 Holguin-Veras et al: p. 852-871	
6	***9/23: Transit Pricing***	9/25: Proposal Peer Evaluation	ETEP: Ch. 4	**Paper Proposal** **due 09/25 by start of class**
7	9/30: Transportation Investments and Economic Development	10/2: Transportation Investments and Economic Development	Bollinger and Ihlanfeldt: p. 179-204 Cervero: p. 83-94 Rephann: p. 437-450	
8	10/7: Intro to Highway Financing	10/9: Highway Financing (Where does the money come from?)	Taylor: p. 293-331 Burbanl and Nigro: HTF Primer Brown: p.10-15	
9	**10/14: Fall Recess** **No Class**	10/16: Highway Financing (Where does the money go?)	Kirk: Donee/Donor States Small: p. 359-381	
10	10/21: Transit Financing	10/23: Private Funds	Lem: p. 10-14 Taking the High Road: p. 247-286 RME: Ch. 5 and Ch. 7	
11	10/28: Introduction to Travel Demand Modeling	10/30: Transportion Modelling in Atlanta Guest Speaker	Modeling Transport: Ch. 1 ARC: Model Documentation	
12	11/4: Trip Generation	11/6: Trip Generation In-class Exercise	*No Readings*	
13	11/11: Trip Distribution	11/13: Trip Distribution In-class Exercise	Haynes: p 1-28, 40-47 Mitchelson and Wheeler: p. 129-165	**Assignment 2: Trip Generation** **due 11/15 by 5 pm**
14	11/18: Mode Choice	11/20: Mode Choice In-class Exercise	*No Readings*	
15	11/25: Trip Assignment	11/27: Other Models	*No Readings*	
16	12/2: Final Paper Presentations	12/4: Final Paper Presentations	*No Readings*	**Assignment 3: Trip Distribution and Mode Choice** **due 12/06 by 5 pm**
FW	No Classes, work on Papers	No Classes, work on Papers	*No Readings*	**FINAL PAPER** **Due 12/11 by 5 pm**