Department of Geography
University of Idaho

GEOG 486-586: Transportation, GIS & Planning
August to December 2010

COURSE OUTLINE

Description

Transport is concerned with the movement of people and goods over a transportation system. Transportation systems play an integral role in supporting a range of daily activities at various scales (e.g., neighbourhood activities to global trade).The performance of such systems affects our quality of life and is therefore a subject of study in many disciplines including geography. Through this course students will explore established and state-of-the-art approaches to the analysis and management of transportation systems. The course begins with a look into the Urban Transportation Modeling System (UTMS), with a view to understanding its technical components and its current role in transportation planning and potential shortcomings. Attention then shifts toward current thinking and cutting-edge research directed at understanding and modelling microscopic (e.g., individual, household) demand for activities and travel. While the broader urban activity system includes numerous stakeholders and subsystems (transport, land use, etc.), the course stresses conceptual, methodological, and data collection issues related to the activity-based approach to travel behaviour analysis and modeling. The application of activity analysis to future models of urban travel demand is also emphasized. The course is ideally suited to students with introductory experience with descriptive statistics, spatial analysis, and geographic information systems (GIS).

Instructor

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Learning Objectives

Upon successful completion of this course, you will:

1. Understand concepts central to the study of transportation systems.
2. Understand how GIS is revolutionizing transportation practice (GIS-T), e.g., TransCad, the leading GIS-T software to solve transportation problems.
3. Correctly identify the components of the urban transportation modeling system, known as UTMS (state-of-the-practice).
4. Describe and discuss the main technical components of UTMS, including regression analysis and the discrete choice modeling framework.
5. Understand the state-of-the-art transportation modeling: the activity-based approach, which is at the disaggregated level (microsimulation) with a focus on individual patterns of activity and travel behavior, and the design of a transportation survey.

Reading "Texts" and Related Resources

Hanson S. and Giuliano G. (Eds.) (2004) *The Geography of Urban Transportation*. Third Edition. New York: Guilford Press.

Black, W.R. (2003) *Transportation: A Geographical Analysis*. New York: Guilford Press.

Ortúzar, J. de D. and Willumsen, L. G. (2001) *Modelling Transport*, Third Edition. Willey, New York.

Miller, H. and Shaw S. L. (Eds.), *Geographic Information Systems for Transportation. Principles and Applications.* New York: Oxford University Press.

Rodrigue, J.P. (Ed.) (2009) *The Geography of Transport Systems*, New York: Routledge, 2009. http://people.hofstra.edu/geotrans/

Additional resources:

Bureau of Transportation Statistics: http://www.bts.gov/

Transportation Engineering Online Lab Manual

Inside the Blackbox, Making Transportation Models Work for Livable Communities (8000 words, estimated time: 2.5 hours)

Travel Surveys: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_571.pdf

"Chapter 2: A critical review of the trip-based, four-step procedure of urban passenger demand forecasting". In Activity-based Modeling System for Travel Demand Forecasting. The Travel Model Improvement Program, Federal Highway Administration, U.S. Department of Transportation: Washington, DC.

A Critical Review of Statewide Travel Forecasting Practice

Transportation planning handbook. John D. Edwards, Jr., ed. 3rd ed. Englewood Cliffs, NJ: Prentice-Hall, 2009. (not an on-line document)

M.P. Meyer and E. J. Miller, *Urban Transportation*, McGraw Hill, New York, 2001.

Urban Transportation Planning in the United States, An Historical Overview. USDOT. 5th Edition.

Calibration and Adjustment of System Planning Models - December 1990 (This is short, but good. I suggest reading this as soon as possible, 6500 words, estimated time: 2 hours)

Model Validation and Reasonableness Checking Manual, 1997 (this is rather large. I suggest you being reading this right after exam 1, 28,000 words, estimated time: 8 hours)

Blackboard

Course material such as lectures and lab exercises will be available on blackboard each week. Other material such as additional readings will also be provided. This can be accessed at the following web address: http://www.blackboard.uidaho.edu (Login: UI Account & Password).

Assessment

Lab Exercises (11)	65%
Research Project (1)	35%

Scale: A: 90-100%, B: 80-89.5%, C: 70-79.5%, D: 60-69.5%, F: <60%

Lectures, Readings and Labs

Lecture notes: Will be posted on blackboard weekly, and the lecture topics and readings are found in the *Course Schedule*. To get the most out of this course, you should read the assigned material for each topic.

Lab: This is a hands-on, project-oriented course. We will use TransCad, ArcGIS, and FHWA Travel demand forecasting software. For TransCad, we will use TransCad Demo versions.

The lab component of this course (normally on Mondays 3:30–5:50pm at MCCL206, but subject to change if announced beforehand) is designed to complement the substantive materials discussed in class**. It is highly recommended that you meet at the lab time and work on the coursework each week.**

Lab Reports: You are required you to present your results in good technical writing style. Getting the answer is usually only half the work.

- Include a title sheet with a title, your names, lab# and date.
- Lab reports should be explanatory with text, maps, graphics, or other specifically required materials per the lab instructions. Label all figures and tables, and refer to them by number in the text.
- Labs should be free of spelling or grammatical errors.
- Always use page numbers.
- An introduction section should include a brief overview of the topic and layout the structure of the report.
- Include a section detailing any problems you had, your solution to the problem, plus any recommendations for improvement of the particular lab exercise.
- Spell-out all abbreviations or acronyms the first time.
- Proof-read your work.
- Reports that are confusing, sloppy or difficult to read will be penalized 20% from the start.
- Submit your lab assignments in hard copy format. One hardcopy per group. **Note: labs are due at the beginning on the following lab period and if late, will receive a penalty (see below).**

Final Project

To receive full credits for this class, each graduate student needs to work on a final project with an undergraduate student. You may propose a transportation planning topic to me that you would like to learn about in more detail. Project topic must be approved by **October 15.**

Deliverable: ~20 page paper (including figures). Must include at least 3000 words of text. Include proper citations and a bibliography. Citations must include more than just html pages (web documents ok), but online info from planning agencies is encouraged.

Exams

There would be no midterms and final exams.

Policy for Late Exercises

Labs will be assigned nearly every Monday (see schedule) and all exercises are due at the times indicated in the *Course Schedule*. Late assignments will be penalized, so get in the habit of turning them in on time! After these times, an exercise will be accepted with a **10% per day penalty** (weekends count as one day). Due dates for students with a doctor's note will be determined on an individual basis.

Academic Dishonesty

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, or loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"). It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at
http://www.webs.uidaho.edu/fsh/2300.html#ARTICLE%20II

Course Schedule (subject to change)

Week/Date	Lectures	Labs: Monday 3:30-5:50pm
1: 8/23	**Topic 1: Course Overview**	**No lab this week**
2: 8/30	**Topic 2: Introduction to Transportation Planning** 1977 FHWA Slide Show (Intro to Transportation Planning.) Play the "part 1" pdf and wav files at the same time - advance slides on "beep"	**Lab1: TransCad Tutorial: GIS and Mapping**
3: 9/6	**Topic 3: Urban Transportation: Patterns and Trends** Hanson, S. (2004). Ch 1 The Context of Urban Travel: Concepts and Recent Trends. In S. Hanson (Ed.), *The Geography of Urban Transport* (pp. 3-29). New York, London: Guilford. Giuliano, G. (1998) Chapter 6 Urban Travel Patterns. Hoyle, B., & Knowles, R. (Eds.), *Modern Transport Geography.* (pp. 113-132). New York: Wiley. McGuckin, N. & Srinivasan, N. (2003). Journey to Work Trends in the United States and its Major Metropolitan Areas 1960 – 2000**.** Federal Highway Administration (Publication No. FHWA -EP-03-058) http://www.fhwa.dot.gov/ctpp/jtw/ Select National Summary or use file 'Journey to Work Trends in the US_Nat Summary.doc'	**Labor Day Holiday**
4: 9/13	**Topic 4: GIS for Transportation Planning: GIS-T Data Models** Miller, H., & Shaw, S.-L. (2001). Ch 3 GIS-T Data Models. In H. Miller, & S.-L. Shaw (Eds.), *Geographic Information Systems for Transportation. Principles and Applications* (pp. 53-62). New York: Oxford University Press. Miller, H., & Shaw, S.-L. (2001). Ch 2 Data Modeling and Database Design. In H. Miller, & S.-L. Shaw (Eds.), *Geographic Information Systems for Transportation. Principles and Applications* (pp. 14-32). New York: Oxford University Press. Black, W.R. (2003) Chapter 17: GIS-T: An Introduction, *Transportation: A Geographical Analysis*. New York: Guilford Press.	**Lab 1 due at 3:30pm** **Lab 2: TransCad Tutorial: Travel Patterns**
5: 9/20	**Topic 5: Basic Elements of Transportation networks: Links and Nodes** Black, W.R. (2003) Chapter 4: Basic Elements of Transportation Networks: Nodes and Links, *Transportation: A Geographical Analysis*. New York: Guilford Press.	**Lab 2 due at 3:30pm** **Lab 3: TransCad Tutorial: Links, Nodes, Matrices**
6: 9/27	**Topic 6: Urban Form and Measurement of Transportation Networks**	**Lab 3 due at 3:30pm**

	Transport and Urban Form (Video: Road to the Future): http://www.pbs.org/wnet/blueprintamerica/reports/road-to-the-future/video-full-documentary/648/ Muller, P.O. (2004). Chapter 3: Transportation and Urban Form: Stages in the Spatial Evolution of the American Metropolis. In S. Hanson (Ed.), *The Geography or Urban Transport* (pp. 59-85). New York, London: Guilford. Black, W.R. (2003) Chapter 5: Measurement of Transportation Networks, *Transportation: A Geographical Analysis*. New York: Guilford Press.	**Lab 4: TransCad Tutorial: Networks and Routing**
7: 10/4	**Topic 7: Mobility and Accessibility** BTS *Transportation Statistics Annual Report 1997*, Chapter 6: Transportation, Mobility and Accessibility: An Introduction http://www.bts.gov/publications/transportation_statistics_annual_report/1997/pdf/report.pdf Chapter 2: Transportation and the Spatial Structure (The Notion of Accessibility, in particular), In Jean-Paul Rodrigue (Eds.) *The Geography of Transport Systems*, New York: Routledge, 2009. http://people.hofstra.edu/geotrans/	**Lab 4 due at 3:30pm** **Lab 5: Network Analysis**
8: 10/11	**Topic 8: Introduction to Travel Forecasting/Modeling** Hanson, S. (2004). Chapter 5: The Urban Transportation Planning Process. In S. Hanson (Ed.), *The Geography of Urban Transport* (pp. 115-140). New York, London: Guilford. http://www.caliper.com/TCTravelDemand.htm 1977 FHWA Slide Show (Intro to Travel Demand Modeling.) Play the "part 2" pdf and wav files at the same time - advance slides on "beep"	**Lab 5 due at 3:30pm** **Lab 6: FHWA: Introduction to Travel Forecasting/Modeling** **Note: do not meet in 206. Must work on an XP computer that you can load software on.** FHWA CD: Introduction to Travel Demand Forecasting (ITDF). You need burn a

		disk from the ISO CD Image file located here Assignment: complete the rest of the ITDF certificate track. For instructions, click here Note: individual lab – everyone turn in a certificate.
9: 10/18	**Topic 9: Trip Generation – Production** Black, W.R. (2003) Chapter 9: The Prediction Problem of Flow Generation, *Transportation: A Geographical Analysis*. New York: Guilford Press. Ortúzar, J. de D. and Willumsen, L. G. (2001), Chapter 4: Trip Generation Modelling, *Modelling Transport*, Third Edition. Willey, New York.	**Lab 6 due at 3:30pm** **Lab 7: Trip Generation**
10: 10/25	**Topic 10: Trip Generation – Attraction** Black, W.R. (2003) Chapter 9: The Prediction Problem of Flow Generation, *Transportation: A Geographical Analysis*. New York: Guilford Press. Ortúzar, J. de D. and Willumsen, L. G. (2001), Chapter 4: Trip Generation Modelling, *Modelling Transport*, Third Edition. Willey, New York.	**Lab 7: Trip Generation (con't)**
11: 11/1	**Topic 11: Trip Distribution – The Gravity Model** Black, W.R. (2003) Chapter 10: Spatial Interaction and the Gravity Model, *Transportation: A Geographical Analysis*. New York: Guilford Press. Ortúzar, J. de D. and Willumsen, L. G. (2001), Chapter 5: Trip Distribution Modelling, *Modelling Transport*, Third Edition. Willey, New York.	**Lab 7 due at 3:30pm** **Lab 8: Trip Distribution**
12: 11/8	**Topic 12: Mode Split and Traffic Assignment** Ortúzar, J.d.D., & Willumsen, L.G. (2001). *Modelling Transport*, Third Edition. Willey, New York. Chapter 6: Model Split, Chapter 7: Discrete Choice Models, Chapter 10: Assignment.	**Lab 8 due at 3:30pm** **Lab 9: Mode Split and Traffic Assignment**
13: 11/15	**Topic 13: Activity Approach: Basic Concepts and Methods**	**Lab 9 due at 3:30pm**

	Buliung, R.N. & Kanaroglou, P.S. (2007) Activity/travel behavior research: conceptual issues, state of the art, and emerging perspectives on behavioural analysis and simulation modelling. *Transport Reviews*. Hägerstrand, T. (1970) What about people in regional science? *Papers of the Regional Science Association*, 24: 7-21. Harvey, A.S. (2004) Time use and activity systems. In: D.A. Hensher, K.J. Button, K.E. Haynes and P.R. Stopher (eds.), *Handbook of Transport Geography and Spatial Systems*. New York: Elsevier, pp. 627-646. McKelvey, R.D. and Zavoina, W. (1975) A statistical model for the analysis of ordinal level dependent variables. Journal of Mathematical Sociology, 4: 103-120.	**Lab10: FHWA/NHI Travel Demand Forecasting Workshop** **Note: do not meet in 206. Must work on an XP computer that you can load software on.** Program Download instructions (click here)
14: 11/22	**Fall Recess**	
15: 11/29	**Topic 14: Data Collection** CHASE Website (http://info.wlu.ca/~sdoherty/chase/index.htm) Doherty, S.T. and Miller, E.J. (2000) A computerized household activity scheduling survey. *Transportation*, 27: 75-97. Cambridge Systematics, I. 1996, "1994 Household Activity and Travel Surveys," in *Data Collection in the Portland, Oregon Metropolitan Area: Case Study*, US Department of Transportation, Washington, DC. Stopher, P.R. (2004) GPS, location and household travel. In: D.A. Hensher, K.J. Button, K.E. Haynes and P.R. Stopher (eds.), *Handbook of Transport Geography and Spatial Systems*. New York: Elsevier, pp. 433-450.	**Lab 10 due at 3:30pm** **Lab 11: Activity/Travel Data Collection**
16: 12/06	**No lecture**	**Lab 11 due** **Final Project Due**