CEE 774/874: Transportation Planning

Fall 2007, 3 credits, Tue, Thu 5:45 PM-7:00 PM

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COURSE DESCRIPTION

The course will help students focus on transportation planning and analysis methods. The following transportation topics will be covered: (a) transportation problems, (b) transportation data, (c) transportation planning tools for alternatives analysis, (d) behavioral basis of transportation planning models, and (e) interactions among stakeholders that include local, regional and state officials, citizens and interest groups. First, transportation problems of accessibility, congestion, and pollution, and their associated costs will be discussed. Then we will focus on applying the four-step planning method to analyze impacts of transportation improvements. We will go through the four-step method including data collection (designing surveys and collecting travel and land use data), trip-generation, trip-distribution, modal-choice and traffic assignment. We will study the conceptual and empirical basis of transportation models and learn about relevant software packages. Overall, students will have a chance to learn about transportation models and also contribute ideas to real-life transportation projects.

Students: This course is for students interested in various aspects of transportation planning. They will work on real-life issues related to alternative development patterns and travel. *Students enrolled in 495 will have a different set of assignments and expectations compared with those enrolled in 670/895.*

Prerequisites: The prerequisites are an introductory transportation course and basic knowledge of statistical analysis. However, students with previous work experience or course work in transportation may enroll in the course with the permission of the instructor.

Applications

Students will be exposed to the development of procedure-based transportation planning methods (i.e., the four-step model system) as well as process-based methods (e.g., systems that support individual and group interactions). Assignments will include readings to familiarize students with existing transportation planning models and their interpretation. Students will learn about transportation planning software. CUBE is a package used for transportation planning by the Virginia Department of Transportation. This is a GIS-based software and facilitates model estimation and prediction. Students will also learn to critique the models and work on process-based approaches to transportation planning. Ultimately, it is the synergy of unstructured human communication, semi-structured knowledge (e.g., from historical cases of transportation actions) and structured models that are needed for improving transportation systems.

Class Project

Typically, regional agencies collect behavioral data to calibrate their transportation models. For the class project, students will focus on a behavioral dataset collected by transportation agencies. Class assignments will lead to a final project, though in the final project students will put the pieces together, all the way from formulating the problem and demonstrating the use of the appropriate methodology to identify appropriate solutions and their impacts. Students will:

- Review plans developed by a region and identify critical issues for the region
- Review a typical survey instrument and the behavioral data
- Analyze data and develop models—especially trip generation and mode choice models
- Conduct impact analyses of scenarios

- Summarize findings
- Write a final report

The final product will be one report. But students will be divided into smaller more manageable groups for the purpose of individual assignments. The class project will be evaluated according to the following criteria:

- *Problem definition:* Is it clear to both the reader and writer? Is it complete? (Weight=1)
- *Approach and analysis:* Is the four-step process adequately applied? Are conceptual framework and hypotheses well developed? Are data validity issues adequately addressed? Are the major analysis issues overlooked? Is the study internally and externally valid? Are biases (if present) explicitly recognized and addressed? (Weight=5)
- *Conclusions and recommendations:* Are the conclusions valid and properly supported? Are the conclusions generalizable? Do they make sense? Will they work? Are they defensible and defended? (Weight=2)
- *Presentation quality:* Are the style, grammar, and format adequate? Is the paper free of sensitive/advocacy statements and special interests? (Weight=1)

Requirements
The requirements for this course include:

- Active class participation—5% of the grade.
- Assignments—40% of the grade. The weight for each assignment will be determined in accordance with the amount of work involved (to be provided with each assignment).
- Final class project—55% of the grade. The class project will be research oriented.

Note that there is no final examination.

Administrative Issues

Registration
Students must register as CEE 495/670/895. Students with special registration problems should see the instructor.

Class Meeting Schedule changes
The dates of classes as planned are shown in this handout. If it is necessary to reschedule a class, every effort will be made to accommodate the needs of as many students as possible. Please check Blackboard for any changes to scheduled classes.

Office Hours
The schedule of office hours is Tue 3:00-5:00 PM. The easiest way to meet me is to fix an appointment by emailing me or calling me (Tel: 757-683-6701).

Please contact me if you have any questions, problems with the readings, or ideas you wish to discuss.

Software
To reinforce course objective and facilitate analysis recommended for class projects, students may use SPSS and/or a transportation planning software CUBE.

OVERVIEW OF COURSE SCHEDULE AND CONTENT

Date	Topic	Assignment schedule (tentative)
Week 1: Aug 28, 30	Intro & overview	
Week 2: Sep 4, 6	Transportation plans & surveys	Assignment 1: Data familiarization
Week 3: Sep 11, 13	Models and data	
Week 4: Sep 18, 20	Trip generation	Assignment 2: Trip generation
Week 5: Sep 25, 27	Trip generation	
Week 6: Oct 2, 4	Trip generation/distribution	Assignment 3: Trip distribution
Week 7: Oct 11*	Trip distribution	
Week 8: Oct 16, 18	Trip distribution	
Week 9: Oct 23, 25	Modal split	Assignment 4: Mode choice
Week 10: Oct 30, Nov 1	Modal split	
Week 11: Nov 6, 8	Modal split	
Week 12: Nov 13, 15	Traffic assignment	Assignment 5: Traffic Assignment
Week 13: Nov 20*	Traffic assignment	
Week 14: Nov 27, 29	Traffic assignment	
Week 15: Dec 4, 6	1. Aggregation, transferability, synthesis 2. Class presentations (date flexible)	
Week 16: Dec 11	Exam week-no class	*Class project due Dec 11, 5:00 PM*

*Note: No class due to Oct 6-9 Fall break and Nov 21-25 Thanksgiving break.

COURSE READINGS

Main readings will be assigned from:

- (**PP**) Papacostas C., and P. Prevedouros, Transportation Engineering and Planning, 3rd Ed., NJ: Prentice-Hall, 2000. **(for 495)**
- (**OW**) Ortuzar J., and L. Willumsen, *Modeling Transport*, Third Edition, New York: John Wiley and Sons, 2001. **(for 670/895)**
- (**KB**) Koppelman F. and C. Bhat, A Self Instructing Course in Mode Choice Modeling: Multinomial and Nested Logit Models, USDOT, Federal Transit Administration, 2006. (former incarnation is
- (**HKL**) Horowitz, J., F. Koppelman, and S. Lerman. *A Self-Instructing Course in Disaggregate Mode Choice Modeling*. Report # IA-11-0006, US DOT, UMTA, Washington, D.C., 1986.) **(for 475 & 670/895)**

Additional readings may be assigned from the following books/reports (some of them will be made available at the course Blackboard website):

- Theoretical Foundation of Travel Choice Modeling, T. Garlang T. Laitila and K. Westin (Ed), Pergamon Press, 1998.
- Sheffi, Y. Urban Transportation Networks, Prentice Hall, 1985.
- The Geography of Urban Transportation, Edited by S. Hanson and G. Giuliano, Guilford, 2004.
- User Manuals from Travel Demand Modeling Software CUBE.
- A Transportation Modeling Primer
- NCHRP 365, Travel Estimation Techniques for Urban Areas,

I expect students to do the readings before each class. Following are the assigned readings for each week.

Week 1: **Overview**

Class A) Readings

The first class will introduce the course material and discuss the course approach.

Class B) Readings
None

Week 2: **Transportation plans and surveys**
Class A) Readings
None

Class B) Readings
CEE 670 & 895 Review Intro and math pre-requisites, Chapters 1 **OW,** 1-53
See NHTS—National Household Travel Survey, 2001 as an example of household transportation survey. (http://nhts.ornl.gov/2001/usersguide/index.shtml)
Beimborn, E. and R. Kennedy, Inside the blackbox, Environmental Defense Fund, 1996, pp. 1-56. (http://www.uwm.edu/Dept/CUTS/primer.htm)

CEE 495 Chapter 7 in **PP**, 318-335.
See NHTS—National Household Travel Survey, 2001 as an example of household transportation survey. (http://nhts.ornl.gov/2001/usersguide/index.shtml)
Beimborn, E. and R. Kennedy, Inside the blackbox, Environmental Defense Fund, 1996, pp. 1-56. (http://www.uwm.edu/Dept/CUTS/primer.htm)

Week 3: **Models and data**
Class A) Readings
Data and space, Chapter 3 in **OW**, 55-72

CEE 495 Chapter 7 in **PP**, 335-345.

Class B) Readings
Data and space, Chapter 3 in OW, 73-119

CEE 495 Chapter 7 in **PP**, 335-345.

Week 4**: Trip generation**
Class A) Readings
Trip generation modeling, Chapter 4 in **OW**, 123-142

CEE 495 Chapter 8 in **PP**, 348-361.

Class B) Readings
Trip generation modeling, Chapter 4 in **OW**, 123-142

CEE 495 Chapter 8 in **PP**, 348-361.

Week 4**: Trip generation**
Class A) Readings
Trip generation modeling, Chapter 4 in **OW**, 142-158

CEE 495 Chapter 8 in **PP**, 348-361.

Class A) Readings
Trip generation modeling, Chapter 4 in **OW**, 142-158

CEE 495 Chapter 8 in **PP**, 348-361.

Week 5**: Trip generation**

Class A) Readings
No readings—focus on trip attractions.

***Week 6*: Trip generation and distribution**
Class A) Readings
No readings—focus on trip balancing

Class B) Readings
Trip distribution modeling, Chapter 5 in **OW**. 163-173

CEE 495 Chapter 8 in **PP**, 361-381.

***Week 7*: Trip distribution**
Class A) Readings
Trip distribution modeling, Chapter 5 in **OW**. 174-188.

CEE 495 Chapter 8 in **PP**, 361-381.

Class B) Readings
No readings. Discussion of trip distribution is Planning software.

***Week 8*: Trip distribution**
Class A) Readings
Trip distribution modeling, Chapter 5 in **OW**. 191-195

CEE 495 Chapter 8 in **PP**, 361-381.

Class B) Readings
No readings.

***Week 9*: Modal split**
Class A) Readings
Mode choice modeling, Chapters 1 to 3 in **HKL**. Also, read relevant portions in **KB** (page # to be given)

Class B) Readings
Mode choice modeling, Chapters 4 to 6 in **HKL**. Also, read relevant portions in **KB** (page # to be given)

***Week 10*: Modal split**
Class A) Readings
Modal split, Chapter 6 in **OW**, 199-211

CEE 495 Chapter 8 in **PP**, 381-400.

Class B) Readings
Discrete choice models, Chapter 7 in **OW**, 219-228

CEE 495 Chapter 8 in **PP**, 381-400.

***Week 11*: Modal split**
Class A) Readings
Discrete choice models, Chapter 7 in **OW**, 228-235

CEE 495 Chapter 8 in **PP**, 381-400.

Class B) Readings

Discrete choice models, Chapter 8 in **OW**, 249-273

CEE 495 Chapter 8 in **PP**, 381-400.

***Week 12*: Traffic assignment**
Class A) Readings
Traffic assignment, Chapter 10 in **OW**, 321-337

CEE 495 Chapter 8 in **PP**, 400-422.

Class B) Readings
Traffic assignment, Chapter 10 in **OW**, 321-337

CEE 495 Chapter 8 in **PP**, 400-422.

***Week 13*: Traffic assignment**
Classes A) & B) Readings
Traffic assignment, Chapter 10 in **OW**, 337-352

CEE 495 Chapter 8 in **PP**, 400-422.

***Week 14*: Traffic assignment**
Classes A) Readings
No readings—discussion of comprehensive example

Classes A) Readings
No readings—discussion of comprehensive example

***Week 15*: Aggregation and model transferability**
Class A) Readings
Aggregation, Chapter 7 in **HKL**.
Model aggregation and transferability, Chapter 9 in **OW**, pp. 307-318

CEE 495 Aggregation, Chapter 7 in **HKL**.

Class B) Readings
No readings-class presentations.

Please Remember: Final project is due Dec 11, 5:00 PM