

# CE 4311: Urban Transportation Infrastructure Planning

Fall 2016

## UTA Civil Engineering Program

Classes:	Tuesdays and Thursdays, 9:30 – 10:50 pm, Wolfe Hall 221	
Professor:	Dr. Stephen Mattingly	
Phone:	272-2859	
E-mail:	mattingly@uta.edu	
Office:	Nedderman Hall 432	
Office Hrs:	Tuesdays and Thursdays, 11-12 and 2-3, or by appointment	
Teaching Assistant:	Saeed Reza Ramezanpour Nargesi, saeedreza.ramezanpournargesi@mavs.uta.edu>	
Textbooks:	<b>Required:</b> <u>Modeling Transport</u> , Ortúzar and Willumsen, 4 <sup>th</sup> Ed.	
References:	<u>Urban Transportation Planning</u> , Meyer and Miller, 2 <sup>nd</sup> Edition <u>Metropolitan Travel Forecasting</u> , Transportation Research Board, Special Report 288	
Software:	TransCAD and Microsoft EXCEL or other spreadsheet	
Prerequisite:	CE 3302	
Grades:	Homework & Meeting Summary	8%
	Quizzes	2%
	Mid-Term	21%
	Final	35%
	TransCAD Project and Presentation	34%
	<i>Extra Credit</i> : Data Project	up to 10%
Course Context:	Engineers in the transportation field and urban planners require the skills used in transportation planning to effectively understand the transportation system and urban form. Effective transportation planning requires the understanding of existing techniques and a thorough understanding of their limitations.	
Course Goals:	<ol style="list-style-type: none"><li>1. Develop transportation system planning concepts</li><li>2. Introduce students to the use of TransCAD</li><li>3. Improve transportation planning and modeling skills</li><li>4. Create an understanding of the planning process</li><li>5. Identify practical applications for the planning process</li><li>6. Improve writing and presentation skills</li></ol>	

## CE 4311/5337 Schedule

<b>Date</b>	<b>Topic</b>	<b>Text</b>	<b>Assignment Due</b>
Aug 25	Introduction, Review Supply and Demand	Chapter 1	
Aug 30	Why do we need Transportation Planning? And the Planning Process	Chapter 1	
Sep 6	Sampling, Modeling and Data Collection	Chapter 3	
Sep 8	Data Collection and Networks	Chapter 3	<b>1: Sampling and Data Analysis HO</b>
Sep 13	Lab1: Introduction to TransCAD		
Sep 15	Lab2: Introduction to TransCAD II		
Sep 20	Trip Generation: General and Regression	Chapter 4	<b>Data Project/Paper Proposal Due</b>
Sep 22	Trip Generation: Cross-Classification	Chapter 4	<b>2: Sampling Design HO</b>
Sep 27	Lab3: Trip Generation		
Sep 29	Trip Distribution: Growth Factor	Chapter 5	
Oct 4	Trip Distribution: Gravity	Chapter 5	<b>3: Trip Generation HO</b>
Oct 6	Trip Distribution: Calibration and Issues	Chapter 5	
Oct 11	Lab4: Trip Distribution		<b>4: Trip Distribution HO</b>
Oct 13	Catching Up/Review/Modal Split		
Oct 18	Modal Split	Chapter 6	
Oct 20	Midterm		
Oct 25	Discrete Choice Models: Multinomial Logit	Chapter 7	
Oct 27	Lab5: Mode Choice		
Nov 1	Assignment: Basics	Chapter 10	<b>5: Mode Choice HO</b>
Nov 2	<i>Last Day to Drop</i>		
Nov 3	Assignment: Beyond AON	Chapter 10	
Nov 8	Equilibrium methods: Equilibrium assignment	Chapter 11	
Nov 10	Lab6: Traffic Assignment		
Nov 15	Validation and Forecasting		<b>6: Basic Assignment HO</b>
Nov 17	Lab7: Putting it all together		<b>Data Project/Paper Due</b>
Nov 22	Lab8: Analyzing Problems and Solutions		
Nov 24	NO CLASS: Thanksgiving		
Nov 29	Activity Based Models	Chapter 13	<b>7: Equilibrium Assignment HO</b>
Dec 1	Presentations		
Dec 6	Presentations		<b>TransCAD Project Due</b>
Dec 15	Final: 8 – 10:30 pm		<b>Meeting Summary Due</b>

**IMPORTANT SCHEDULE NOTE:** *As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.*

### **Other Issues**

- Bicycle and Pedestrian Planning
- Transit Planning
- Freight Demand models

### **TransCAD Labs**

The class will have eight TransCAD labs in place of a lecture. These labs will teach the basics for TransCAD's use and its application to the project. Additional office hours for the lab will also be scheduled.

### **Homework**

The homework should be submitted on the day that it is due. I need the homework turned in by this date so that the TA can return the solutions to you within a week. If you are unable to attend class, please submit your homework via e-mail. If the homework is not submitted the maximum score will degrade in the following manner with each deduction associated with class meetings (90%, 70%, 40%).

### **Mid-term and Final (open and closed book)**

The exams will last one and a half hours, and the final will be two and a half hours. While each test will focus on a specific section, any of the course objectives that have been covered to that point may be addressed. All of the problem solving will be open book while other portions of the test will be closed book.

### **Extra credit: Data Project.**

In this project, a student group (typically 2-3 students; however, data collection plans that require more personnel may be used to justify a larger group) will design and implement a data collection strategy. In many cases, this will involve a survey; however, this is not required. All surveys should be designed early in the semester so that they can receive IRB approval. While approval is not required for a class project, if you want to use the data for a poster or to write a paper, IRB approval should be obtained. The url for IRB is included below:

<http://www.uta.edu/research/administration/departments/rs/human-subjects-irb/index.php>

The project should focus on mode choice decisions and students are strongly encouraged to select alternative transportation, such as transit, bicycle, pedestrian, freight, etc. Other topics other than mode choice and alternative transportation may be selected, but should be sufficiently motivated and justified. The data collection may use either a revealed or stated preference approach. All data should be analyzed to answer the research question. A half-page to one page proposal should be submitted early in the semester. The proposal should identify the research question and motivation, sampling strategy and proposed methodology.

### **Presentation**

The findings from either the Data Project or TransCAD project will be presented at the end of the course in a 12-15 minute presentation. The Data Project presentation should cover the research problem, methodology, data analysis and results while the TransCAD presentation should focus on the original solution proposed by your group. The presentations will be graded on content, clarity, and timeliness.

## TransCAD Project/Presentation

For the project, a student group (2-3 students) will develop a transportation-planning model for Arlington using TransCAD. The modeling process and the subsequent recommendations for the future conditions must be presented. Details on the project will be distributed during the first two labs.

### Project Grading Criteria

- Organization 15%
- Clarity 15%
- Content 30%
- Solution
  - Originality 10%
  - Difficulty 10%
  - Content 20%

## Meeting Summary

You will attend one North Central Texas Council of Governments (NCTCOG) Transportation Planning Meetings. After attending the meeting you will write a two-page summary of the activities that occurred. A calendar is provided of current meetings, but the website can be checked for more (<http://www.nctcog.org/trans/calendar.asp>).

*Warning: These are business meetings and most attendees will be addressed appropriately.*

## NCTCOG Meetings

August 26	1:30 PM	Surface Transportation Technical Committee
September 8	1:00 PM	Regional Transportation Council
September 23	1:30 PM	Surface Transportation Technical Committee
October 11	1:00 PM	Regional Transportation Council
October 28	1:30 PM	Surface Transportation Technical Committee
November 10	1:00 PM	Regional Transportation Council
December 2	1:30 PM	Surface Transportation Technical Committee
December 8	1:00 PM	Regional Transportation Council

**Attendance:** At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I allow students to attend class at their own discretion; however, there will be a few unannounced quizzes held during class throughout the semester.

## Computer Lab Usage

Graduate students should not use the lab when it is reserved for other classes. Violations of this policy may result in further restrictions to your access to NH 239.

To gain entrance, students will need their ID card and 5-digit PIN number, which can be obtained by going to this site:

<https://www.uta.edu/oit/verifynetid>

The PIN number is unique to each student & is assigned by the university, not the department.

**Emergency Exit Procedures:** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located through the two doors at the front and back of the room. After leaving through these doors, the closest exits are to the left; however, if those exits are blocked, please turn right and proceed to the end of the corridor and through the doors where there are another exits; the closest is to the left and the far one is to the right. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://wweb.uta.edu/ses/fao>).

**Academic Integrity:** All students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

*I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

*I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

Instructors may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

## **Missed Exams**

If an exam is to be missed, I should be contacted immediately. If I do not hear from you on or before the test day, and you do not have an adequate medical/family emergency (hospitalization/doctor's note/death certificate), you will receive a zero on the exam.

**Final Review Week:** A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

**Americans with Disabilities Act:** The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364.

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

**Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

**Student Support Services:** UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](#), [major-based learning centers](#), developmental education, [advising and mentoring](#), personal counseling, and [federally funded programs](#). For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to [resources@uta.edu](mailto:resources@uta.edu), or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

**The IDEAS Center** (2<sup>nd</sup> Floor of Central Library) offers **free** tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. To schedule an appointment with a peer tutor or mentor email [IDEAS@uta.edu](mailto:IDEAS@uta.edu) or call (817) 272-6593.

**The English Writing Center (411LIBR):** The Writing Center Offers free tutoring in 20-, 40-, or 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Our hours are 9 am to 8 pm Mon.-Thurs., 9 am-3 pm Fri. and Noon-6 pm Sat. and Sun. Register and make appointments online at <http://uta.mywconline.com>. Classroom Visits, workshops, and specialized services for graduate students are also available. Please see [www.uta.edu/owl](http://www.uta.edu/owl) for detailed information on all our programs and services.

The Library's 2<sup>nd</sup> floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation. <http://library.uta.edu/academic-plaza>

**Librarian to Contact:** [Martin Wallace](#), [martin.wallace@uta.edu](mailto:martin.wallace@uta.edu), 817-272-3924, [Office Hours](#)

**Title IX:** The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit [www.uta.edu/titleIX](http://www.uta.edu/titleIX) or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or [jmhood@uta.edu](mailto:jmhood@uta.edu).*

### ABET Outcomes and Coverage

a.	Ability to apply knowledge of mathematics, science and engineering	T <sub>I</sub>
b.	Ability to design and conduct experiments	C <sub>I</sub>
	Ability to analyze and interpret data	T <sub>I</sub>
d.	Ability to function as a member of a team	C <sub>I</sub>
e.	Ability to identify and solve civil engineering problems	T <sub>I</sub>
g.	Ability to communicate effectively	T <sub>I</sub>
h.	Broad education necessary to understand the impact of engineering solutions in a global/societal context	C <sub>I</sub>
i.	Recognition of the need to engage in life-long learning	C <sub>I</sub>
j.	Knowledge of contemporary societal/engineering issues	C <sub>E</sub>
k.	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice	T <sub>I</sub>



## Objectives:

1. Be able to produce a systematic description of land-use and transportation.
2. Be able to calculate and compare various elasticities.
3. Be able to explain the differences between supply and demand with respect to transportation and classical economics.
4. Be able to identify critical inputs associated with activity forecasting.
5. Be able to describe the differences in traffic assignment depending on the route choice behavior.
6. Be able to create a strategy for evaluating alternatives and planning for future improvements.
7. Be able to use TransCAD to develop Trip Generation, Trip Distribution, Mode Choice and Trip Assignment Models.
8. Be able to forecast future conditions using TransCAD and recommend alternatives to remedy any potential bottlenecks.
9. Be able to explain the role congestion pricing can serve as a planning tool and describe its theoretical appeal.
10. Be able to describe the similarities and differences between site impact analysis and the 4-step modeling process.
11. Be able to discuss and apply economic theory to transportation examples
12. Be able to choose between different modeling approaches and justify this decision.
13. Be able to recognize and generally describe the political process associated with transportation planning.
14. Be able to compare and contrast aggregate and disaggregate models
15. Be able to design a sampling strategy and justify the use of a particular survey type (data collection scheme).
16. Be able to define: link, node, TAZ, zonal centroid and other zonal and network terms.
17. Be able to critique a proposed trip generation or attraction model.
18. Be able to create and apply a regression model for zonal or household data.
19. Be able to create and apply a cross classification model.
20. Be able to create and apply a gravity model.
21. Be able to calibrate a gravity model.
22. Be able to create and apply a growth factor model for trip distribution
23. Be able to compare and contrast the gravity models and growth factor models.
24. Be able to calibrate binary, multinomial and hierarchical logit models.
25. Be able to create and apply binary, multinomial and hierarchical logit models.
26. Be able to construct an example of the IIA axiom and verify its impact.
27. Be able to specify a multinomial logit model and critique its parameters, variable selection and goodness-of-fit.
28. Be able to explain Wardrops' first and second principles.
29. Be able to construct a shortest path tree using an algorithm.
30. Be able to apply all-or-nothing assignment.
31. Be able to apply stochastic assignment.
32. Be able to apply incremental assignment.
33. Be able to identify limitations to classic assignment models.
34. Be able to apply equilibrium assignment using TransCAD.
35. Be able to plan pedestrian and bicycle facilities.
36. Be able to explain the differences between different classes of bicycle facilities.
37. Be able to assess the advantages and disadvantages of bicycle facilities.
38. Be able to design a transportation planning strategy for addressing a specific project.