CE 321 Transportation Systems, Unique # 16615
Fall 2023: Tuesdays and Thursdays, 2:00 – 3:30 p.m.

Course Description

This course will include a review and application of selected engineering, economic and mathematical concepts and principles employed to address highway transportation issues in the United States. Several major aspects of highway transportation -- transportation planning, travel forecasting, traffic engineering, and geometric design -- will be addressed.

Prerequisite: Civil Engineering 311S.

Academic/Learning Goals of the Course

- Provide an understanding of the basic principles and methods used by engineers and planners in the planning, design, and operation of highway transportation systems.
- Illustrate the application of the basic principles and methods of transportation engineering and planning in urban and rural travel environments.
- Expose students to real-world design and analysis problems.
- Provide a forum for the exchange of ideas and thoughts regarding issues related to highway transportation.

Text

There is no text for this course. Students are required to purchase a course packet available at a local copy shop.

Class Format/Attendance & Participation

Classes will be a combination of lecture and discussion. Students are expected to participate actively in class discussions. Homework assignments will be given, and analysis of these assignments will be the basis for some class discussion. In this regard, both regular class attendance and contributions to class discussions will play a role in determining the class participation contribution toward the final grade. In addition, attendance in class will be an important aspect of understanding course material and being prepared for the mid-term and final examinations. As such, students are expected to attend each class, except in exceptional medical or other personal circumstances.

Course Outline

Two major topic areas will be addressed in this course: (i) Transportation Systems Analysis and Planning and (ii) Traffic Engineering. Under the first topic, the following issues will be discussed: components of transportation systems planning, travel demand and supply functions, demand-supply equilibration, overview of the urban transportation model system, linear regression analysis, and modeling components of the urban transportation model system. In the area of Traffic Engineering, the following issues will be covered: components of the traffic engineering system, human and vehicle characteristics, roadway characteristics and geometric design, traffic stream models and applications, introduction to traffic control, and principles of

intersection signal design. The course will begin with about two lecture periods devoted to the topic of Transportation and Society.

Meeting Time and Location: 2:00 p.m. – 3:30 p.m., Tuesdays and Thursdays in PAR 301.

Office hours: 9:30 a.m. – 10:30 a.m., Tuesdays and Thursdays in ECJ 6.810.

Grading

Grades will be based on homework assignments (25%), class participation (5%), one mid-term examination (30%) and one final examination (40%). Students are expected to work independently on the homework assignments. Homework assignments will be due at the beginning of the class period on the date specified. No assignments will be accepted after the due date, except in very exceptional circumstances.

The mid-term examination will be held during class hours on Thursday, October 12th. The final examination is scheduled for 8:00 a.m. on Thursday, December 7th.

Web Site: The web site for the course is http://canvas.utexas.edu/ (Canvas).

Student Evaluation of Teaching

An evaluation of the course and instructor will be conducted on November 28th using the approved UT Course/Instructor evaluation forms. The first 15-20 minutes of this class period will be reserved for the evaluation.

Anticipated Homework Assignments

1. **Demand-Supply Equilibration**
      Distribution: Sept. 5   Submission: Sept. 14   Return: Sept. 26

2. **Trip Generation and Trip Distribution** (case study application)
      Distribution: Sept. 12   Submission: Sept. 28   Return: Oct. 3

3. **Mode Choice and Traffic Assignment** (case study application)
      Distribution: Sept. 28   Submission: Oct. 5   Return: Oct. 10

4. **Human and Vehicle Characteristics**
      Distribution: Oct. 24   Submission: Oct. 31   Return: Nov. 7

5. **Roadway Characteristics and Design**
      Distribution: Nov. 2   Submission: Nov. 9   Return: Nov. 14

6. **Traffic Stream Models and Applications**
      Distribution: Nov. 9   Submission: Nov. 16   Return: Nov. 28

7. **Intersection Signalization**
      Distribution: Nov. 16   Submission: Nov. 30   Return: Dec. 4

Relationship of the Course to Student Outcomes

This course is designed to achieve the ABET Student Outcomes marked with an "X" in the first column.

	Student Outcomes
X	1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
	2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
	3. An ability to communicate effectively with a range of audiences
X	4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
	5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
	6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Other General Information

Letter grades are used to record the instructor's evaluation of students' performance in a course. The following grades are used: *A*, *A–*, *B+*, *B*, *B–*, *C+*, *C*, *C–*, *D+*, *D*, *D–*, and *F*. To receive credit for a course, an undergraduate student must earn a grade of at least *D–*. To include a course in the Program of Work for a graduate degree, a graduate student must earn a grade of at least *C*.

Undergraduate Student Drop Policy: From the 1st through the 12th class day, an undergraduate student can drop a course via the web and receive a refund, if eligible. From the 13th through the university's academic drop deadline, a student may Q drop a course with approval from the Dean, and departmental advisor.

Students with Disabilities: The University of Texas at Austin provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Disability & Access, phone: 512-471-6259 (email: access@austin.utexas.edu) or http://diversity.utexas.edu/disability/.

Web-Based Class Sites: Web-based, password-protected class sites will be associated with all academic courses taught at the University. Syllabi, handouts, assignments and other resources are types of information that may be available within these sites. Site activities could include exchanging e-mail, engaging in class discussions and chats, and exchanging files. In addition, electronic class rosters will be a component of the sites. Students who do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1. For information on restricting directory information, visit https://registrar.utexas.edu/students/records/restrictmyinfo.

Academic Integrity: Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. For further information, visit the Dean of

Students' website at: http://deanofstudents.utexas.edu/conduct/, and the General Information Catalog: https://catalog.utexas.edu/general-information/appendices/appendix-c/student-conduct-and-academic-integrity/.

Sharing of Course Materials is Prohibited: No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

Class Recordings: Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

Religious Holy Days/Attendance:
A student who misses classes or other required activities, including examinations, for the observance of a religious holy day should inform the instructor as far in advance of the absence as possible, so that arrangements can be made to complete an assignment within a reasonable time after the absence: http://catalog.utexas.edu/general-information/academic-policies-and-procedures/attendance/

Important Safety Information: COVID-19 Information and resources: https://protect.utexas.edu/.

Emergency Preparedness Plan: Emergency Preparedness means being ready. It takes an effort by all of us to create and sustain an effective emergency preparedness system. You are your own best first responder. Please use https://preparedness.utexas.edu/welcome-emergency-preparedness as a resource to better understand emergency preparedness at the university, and how you can become part of and contribute to the preparedness community. To monitor emergency communications for specific instructions, go to https://utexas.edu/emergency. To report an issue (none emergency) call 512-471-4441. In case of emergency, call 911.

Emergency Evacuation:
- Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Dept., The University of Texas at Austin Police Dept., or Fire Prevention Services office.
- **Behavior Concerns Advice Line (BCAL) 512–232-5050. For more information visit the BCAL website:** https://safety.utexas.edu/behavior-concerns-advice-line
- Link to information regarding emergency evacuation routes and emergency procedures can be found at: www.utexas.edu/emergency

All other university policies not explicitly included on this syllabus can be found on the General Information Catalog: http://catalog.utexas.edu/general-information/.

Detailed Course Outline and Readings (included in course packet)

1. Transportation and Society

    General open discussion and reading from Khisty, Chapter 1, Sections 1-4, 8

2. Transportation Systems Analysis and Planning

    2.1   Components of Transportation Systems Analysis (Khisty, Chapter 1, Section 5)

    2.2   Travel Demand-Supply Functions and Equilibration (Mannheim, Chapter 1, pages 10-38)
          - Demand and Supply Functions
          - Demand-Supply Equilibration

    2.3   Overview of the Urban Transportation Model System or UTMS (Khisty, Chapter 11, Section 8/10)

    2.4   Linear Regression Analysis (Bhat notes 1)

    2.5   Modeling Components of the UTMS (material drawn from Papacostas and Prevedouros, Chapter 8 and Garber and Hoel, Chapter 11)
          2.5.1 Trip Generation
          2.5.2 Trip Distribution
          2.5.3 Modal Choice
          2.5.4 Traffic Assignment

3. Traffic Engineering

    3.1   Components of the Traffic Engineering System (McShane and Roess, Chapter 3)
          - Human and Vehicle Characteristics
          - Roadway Characteristics and Design

    3.2   Traffic Stream Models and Applications (material drawn from May, Chapter 10 and McShane and Roess, Chapter 29)
          3.2.1   Traffic Stream Models
          3.2.2   Application of Traffic Stream Models

    3.3   Introduction to Traffic Control (McShane and Roess, Chapter 18)

    3.4   Principles of Intersection Design (Bhat notes 2)

References
1. Khisty, J.C. (1990). Transportation Engineering: An Introduction, Englewood Cliffs, Prentice Hall, NJ.
2. Manheim, M.L. (1979). Fundamentals of Transportation Systems Analysis, Volume 1: Basic Concepts, MIT Press, Cambridge, MA.
3. Bhat, C.R. notes 1. Linear Regression Model
4. Papacostas, C.S. and Prevedouros (1993). Fundamentals of Transportation Engineering, Prentice Hall, Inc., Englewood Cliffs, NJ.
5. Garber, N.J. and L.A. Hoel (1988). Traffic and Highway Engineering.
6. McShane, W.R. and R.P. Roess (1990). Traffic Engineering, Prentice Hall, Inc., Englewood Cliffs, NJ.
7. May, A.D. (1990). Traffic Flow Fundamentals, Prentice Hall, Inc., Englewood Cliffs, NJ.
8. Bhat, C.R. notes 2 Signalization Fundamentals