The University of Texas at Austin
Dept. of Civil, Architectural & Environmental Engineering

Prof. Chandra R. Bhat
ECJ 6.810 / 471-4535

CE 321 Transportation Systems - Fall 2015
Tuesdays and Thursdays, 12:30 p.m. - 2:00 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: 12:30 p.m. – 2:00 p.m., Tuesdays and Thursdays in ECJ 1.204.

Office hours: 2:00 p.m. – 3:00 p.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 15. The final examination is scheduled for 7:00 – 10:00 p.m. on Wednesday, December 9.

Student Evaluation of Teaching

An evaluation of the course and instructor will be conducted on December 1st using the approved UT Course/Instructor evaluation forms. The first 15-20 minutes of this class period will be reserved for the evaluation.

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 class day 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, Services for Students with Disabilities, 512-471-6259 or http://www.utexas.edu/diversity/ddce/ssd.

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, see the General Information Catalog: http://catalog.utexas.edu/general-information/the-university/.

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 Student Judicial Services web site http://deanofstudents.utexas.edu/sjs/, and the General Information Catalog: http://catalog.utexas.edu/general-information/the-university/.

Anticipated Homework Assignments

1. Demand-Supply Equilibration

Distribution: Sept. 10 Submission: Sept. 17 Return: Sept. 22

2. Trip Generation and Trip Distribution (case study application)

Distribution: Sept. 22 Submission: Sept. 29 Return: Oct. 6

3. Mode Choice and Traffic Assignment (case study application)

Distribution: Oct. 1 Submission: Oct. 8 Return: Oct. 20

4. Human and Vehicle Characteristics

Distribution: Oct 27 Submission: Nov. 3 Return: Nov. 10

5. Roadway Characteristics and Design

Distribution: Nov. 3 Submission: Nov. 10 Return: Nov. 17

6. Traffic Stream Models and Applications

Distribution: Nov. 10 Submission: Nov. 17 Return: Nov. 24

7. Intersection Signalization

Distribution: Nov. 19 Submission: Dec. 3 Return: Dec. 7

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, New Jersey.

2. Manheim, M.L. (1979). Fundamentals of Transportation Systems Analysis, Volume 1: Basic Concepts, MIT Press, Cambridge, Massachusetts.

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, New Jersey.

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, New Jersey.

7. May, A.D. (1990). Traffic Flow Fundamentals, Prentice Hall, Inc., Englewood Cliffs, New Jersey.

8. Bhat, C.R. notes 2 Signalization Fundamentals