

**CVEN 4365 INTRODUCTION TO TRANSPORTATION ENGINEERING
Fall 2017**

1. Course Information

Time: Monday and Wednesday 1:50pm - 3:10pm

Classroom: Cherry Building 2104

Instructor: Xing Wu, Ph.D., Assistant Professor, Department of Civil and Environmental Engineering.

Textbook: *Principles of Highway and Traffic Engineering*, Fifth Edition, by Fred L. Mannering, Scott S. Washburn, John Wiley and Sons, Inc., 2011. ISBN 978-1-118-12014-9

Office Hours: MW, 12:45 pm to 1:45 pm (or contact to set up an appointment).

Office: Room 2032, Cherry Engineering Building

Phone: 409-880-8757, **Email:** xing.wu@lamar.edu

2. Course Description and Learning Objectives

The purpose of this course is to introduce students to the principles of transportation engineering with a focus on highway engineering and traffic analysis. The course covers fundamental concepts and principles that guide road design, as well as the movement and control of vehicular traffic. Specifically, these include geometric design, traffic flow theory, highway capacity analysis, traffic signal operations and travel demand and forecasting.

The materials learned are intended to provide the basic skill set that will allow students to solve transportation problems that are likely to appear in professional practice and on the Fundamentals of Engineering exam (FE) and the Principles and Practice of Engineering exam (PE). The materials also serve as a foundation for future coursework in Transportation Engineering.

The course is designed for upper level undergraduate students and graduate students.

3. ABET Program Educational Objectives

For students completing undergraduate degree programs in civil engineering or in environmental engineering, this course addresses the following Program Outcomes: ¹

- (a) An ability to apply principles of mathematics, science, and engineering. (H,E) ²
- (e) An ability to formulate and solve engineering problems. (H,E)
- (h) Broad education necessary to understand the impact of engineering solutions in a global context
- (k) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice, including concepts of professional practice. (H,E)

¹ These outcomes correspond to the "a-k" Learning Outcomes specified by the Accreditation Board of Engineering and Technology (ABET)

² Homework (H), Exams (E), and Written Reports (R) refer to the deliverables that are used to meet the learning outcomes.

4. Prerequisites

Basic undergraduate calculus and statistics courses, static and dynamic courses.

5. Subject Area and Learning Objective of Each Subject Area

Introduction

- *Topics:* Transportation and society; challenges arising from transportation systems; basic components of highway systems.
- *Learning objectives:* to understand basics and fundamental challenges in transportation systems, particularly highway systems.

Road Vehicle Performance

- *Topics:* Space-time diagram; vehicle movement analysis based on constant acceleration/deceleration, stopping distance, safe following distance, vehicle performance (resistance, acceleration, deceleration, braking)
- *Learning objectives:* to understand fundamental physical rules that govern vehicle movement and influence vehicle performance; to be able to apply these rules to solve simple traffic and road design problems.

Geometric Design of Highways

- *Topics:* Sight requirements; super-elevations; horizontal and vertical alignments.
- *Learning objectives:* to be familiarized with the elements involved in geometric design and the safety concerns that motivate vertical and horizontal curve design; to be able to perform a rudimentary geometric design of a highway section.

Pavement Design

Topics: Flexible pavements; rigid pavements.

- *Learning objectives:* to be familiarized with two types of pavements: flexible and rigid. To be familiarized with the process of determining the lifespan, and other factors related with two types of pavement design.

Traffic Flow Theory

- *Topics:* Definition and measurement of traffic quantities; relationship between traffic quantities; time-mean vs. space-speed; inductive loops; identify and measure traffic congestion.
- *Learning objectives:* to be familiarized with basic quantities that describe vehicular traffic; to build a foundation for understanding highway capacity, as well as more advanced traffic flow theory that explains the mechanism of traffic congestion.

Highway Capacity and Level of Service Analysis

- *Topics:* Basic freeway segments; multi-lane highways.
- *Learning objectives:* to understand the basic highway capacity analysis methods; to be able to use these methods to conduct simple LOS (level of service) analysis for freeway and multilane highways; to develop a basis for understanding Highway Capacity Manual (HCM) and the HCM-based commercial design software.

Traffic Control at Signalized Intersections

- *Topics:* Signal control hierarchy and warrants; signal timing design methods.
- *Learning objectives:* to be familiarized with the elements of signal operations and signal timing analysis methods; to be able to use both analytical methods and commercial software (Synchro) to solve simple signal design problems.

Traffic Demand and Traffic Forecasting

- *Topics*: trip generation; mode choice; route choice; user equilibrium and system optimization
- *Learning objectives*: to be familiarized with the typical trip generation model, logit model for mode choice and the shortest path model; to be able to understand clearly the principles of user equilibrium and system optimization.

6. Attendance policy

Students are **required** to attend ALL lectures. Failing to attend any lecture may result in significant deficiency in understanding subsequent classes. The participation credit depends on in-class/online quizzes and attendance. If you missed more than 5 lectures or 1 quiz, your participation grade is 0.

Students should pay respect to the lecturer and fellow students. Behavior that is destructive to a positive learning environment reported by the professor will result in a warning on the first instance; the second instance might result in expulsion from the course or campus.

No food and no drink!

Please turn off your cell phone!

7. Grading policy

The final grade will be assigned on the following basis:

Homework: 12%

Course Project: 7%

Participation: 9%

Three Exams: Midterm I, Midterm II, and Final, each 24%, total $24\% \times 3 = 72\%$

For three exams, the best one accounts for 150%; and the worse one accounts for 50%.

For example, if one student gets: 60 out of 100, 80 out of 100 and 70 out of 100 from three exams, then her points from all three exams are calculated in this way: $(80 \times 1.5 + 70 + 60 \times 0.5) \times 0.24 = 52.8$

Participation:

The grades of participation depends on in-class/online quizzes and attendance of the class.

If you missed more than 5 lectures. Your participation grade is 0.

Do NOT assume you will receive 9 points if you miss one lecture, or one quiz.

Your final grade: =

12% X (Average of all homework grades) + Points from three exams (calculated as shown in the above example) + 7% X Project grades + Participation credit

Final grade policy:

- ≥ 85 : **A**
- $\geq 75, < 85$: **B**
- $\geq 60, < 75$: **C**
- $< 60, \geq 50$: **D**
- < 50 : **F**

Grade Dispute Policy

- You will have 10 working days to appeal the grade after the official grade is posted.
- All of your grades in homework, midterm, quiz (if any), etc. will be posted on Blackboard.
- 1~2 weeks before the final, please calculate your grade on your own and check with me to see how much you need in the final to receive your desired final grade.
- After two midterms, if you get no more than 55 in both exams, please set an appointment with me.

8. Homework and Exam Policy

Homework:

- i) Working together on homework is encouraged, although students are expected to write up their own versions of solutions.
- ii) Do NOT submit **identical** homework – no credit will be given if your answers in homework are found identical to others!
- iii) Do NOT submit the copy from the solution manual! -- **Your grade will be “F”**.
- iv) All homework assignment and due date will be posted on Blackboard (Page of Announcement).
- v) Please staple all sheets according to the order of problems given originally, and use one side of the sheet. If you staple your answer sheets randomly, **10 points will be deducted**.
- vi) When you staple the sheets, please ensure that all problem numbers are still visible. Otherwise, **5 points will be deducted**.
- vii) Your homework will be graded by TA. Any question of grading, please come to me.
- viii) **Late submission:** the base grade of late homework will be depreciated *10% for every 24-hour delay*.

Exams:

- All exams are open-book and open-note. Calculator is allowed. But no laptop/IPAD/Tablet/Smart-phone is allowed.
- The final exam is scheduled on the official final date or on a date appropriate for the class schedule.
- **Share of textbook/notes/calculator in examinations is NOT allowed and such behavior is regarded as cheating. Working together on exams is strictly forbidden.**
- *No make up exam*

9. Academic dishonesty statement

Students are specifically warned against all forms of cheating and plagiarism. Any forms of academic dishonesty will be subject to the disciplinary procedures of Lamar University.

10. Students with disability statement

Any students with disabilities are advised to contact the professor privately to discuss your special needs. Students with disabilities should also contact the Services for Students with Disabilities by email SFSWD@lamar.edu, phone 409-880-8347, or visit the office in the Communication Building Room 105 to coordinate reasonable accommodations for students with documented disabilities.

11. Schedule (subject to change based on the actual progress)

Lecture	Contents	Note	Assignment Given
1	Course Orientation, Vehicle Performance	Chap. 1, 2	
2	Vehicle Performance	Chap. 2	HW1
3	Labor Day	No class	
4	Vehicle Performance Geometric Design of Highways	Chap. 2, 3	
5	Geometric Design of Highways	Chap. 3	HW2
6	Geometric Design of Highways	Chap. 3	
7	Pavement Design	Chap. 4	HW3
8	Pavement Design	Chap. 4	
9	Pavement Design, Traffic Flow Theory	Chap. 4, 5	
10	Review Session		
11	First Midterm	Covers Chap. 2, 3 and 4	
12	Traffic Flow Theory	Chap. 5	HW 4
13	Traffic Flow Theory	Chap. 5	
14	Queuing theory	Chap. 5	
15	Queuing theory	Chap. 6	HW 5
16	Highway Capacity Analysis	Chap. 6	
17	Highway Capacity Analysis	Chap. 6	
18	Traffic Control	Chap. 6, 7	
19	Traffic Control	Chap. 7	HW 6
20	Review Session		
21	Second Midterm	Covers Chap. 5 and 6	
22	Traffic Control	Chap. 7	
23	Traffic Control	Chap. 7	
24	Traffic Control	Chap. 7	
25	Travel Demand and Forecasting	Chap. 8	HW 7
26	Travel Demand and Forecasting	Chap. 8	
27	Travel Demand and Forecasting	Chap. 8	
28	Travel Demand and Forecasting		
29	Course Project Presentation		
30	Review and Discussions		
	Final Exam*		

* The time of final exam depends on the final schedule announced by the university.

12. Emergency Procedures. Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at: <http://www.lamar.edu/about-lu/administration/risk-management/index.html>.

Following are procedures for the first two:

Severe Weather:

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

Violence/Active Shooter (CADD):

- **CALL** - 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.
- **AVOID** - If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY**- Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.
- **DEFEND**- Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

13. Academic Continuation Policy:

In the event of a campus closure due to hurricane or other disaster courses will continue after a four day lapse to allow time for evacuation. This course will be conducted via email/Blackboard. Students must begin checking their Lamar email address for where instructions and course materials and required student work will be sent and received by the instructor.