The purpose of this course is to provide students with a solid introduction to the principles of transportation engineering with a focus on highway engineering and traffic analysis. This background will be very useful in any Civil Engineering practice – even if your main emphasis is on another area within the CE domain.

The material learned will 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 material also serves as foundation for future coursework in transportation should students wish to pursue further coursework in the field (MS or PhD level).

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Class hours: Tuesday and Thursday, 8a.m. - 9:15a.m. E 328
Office hours: Tuesdays 7:30 a.m. – 8a.m. E 421 J

Course Requirements:

1. Individual homework assignments to be delivered by 8:05 a.m. on Tuesdays. The objective of these assignments is to assist in the learning of course material, so discussion of assignments among students is encouraged – but solutions have to be individual. It is expected that solutions are neatly done – special bonuses will reward those whose solutions are professionally presented in a typed format.

2. In order to develop ABET-mandated teamwork skills, students will form 4-person groups. THREE major group projects will be given during the semester on selected Thursdays. These problems will involve EITHER field data collection and analysis OR a design exercise. The final product will be a typed document to be delivered the very next Tuesday by 8:05 a.m. It is important that each group assignment will have signatures of all four group members confirming that they all contributed approximately 25% of the overall effort to that assignment.

3. In addition, several problem solving assignments will be given to the groups. The exact number of such assignments will depend on the actual class progress in meeting objectives of the course. Those assignments will need to be worked on in class to be collected at the end of a session, signed by all members who contributed to the solution. In order to have a sufficient knowledge for such problem solving excercise, each member of the group is expected to study the class material systematically. Both theory presented in the text and solved examples presented there will be very useful in such preparation. The students should be prepared for consecutive classes so that class focus can be mainly on solving sufficient number of numerical problems; those will be valuable in Engineering practice and on professional exams.

4. In order to demonstrate to ABET students’ ability to perform individual, unsupervised study and develop valuable communication skills, each student will be required to contribute to a major essay exploring some exciting modern transportation technologies or solutions. This again will be a group effort – with confirmation of individual contributions by all group members.


5. One midterm and a final exam will be given. ALL exams will consist of a closed book portion with short-answer questions and a problem-oriented open book portion.

6. Because of the group-oriented class format, perfect attendance is expected. Your individual grade will be negatively affected if you will not participate in ALL the tasks assigned for your group. To account for any unforeseen adverse situation, every student will be allowed to miss ONE homework assignment without penalty. As a result, NO LATE HOMEWORK will be accepted.
The following grade distribution will be used for the course:

- Design and Problem Solving Assignments: 15%
- Research paper: 15%
- Mid-term: 20%
- Group Projects: 20%
- Final exam: 30%

Course Information: In class and via Blackboard. My TA will be a liaison between individual class members and myself.

Text:


Preliminary Lecture Schedule

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<th>Topic</th>
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<td>Chapter 1</td>
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<td>Vehicles. Tractive Effort. Resistances</td>
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<td>Acceleration, Deceleration, Reaction time. Stopping Sight Distance</td>
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<td>9/23</td>
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<td>GROUP PROJECT #1</td>
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<td>GROUP PROJECT #2</td>
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<td>Chapters 2, 3 &amp; 5</td>
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<td>MIDTERM</td>
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<td>10/21</td>
<td>Field Trip to Caltrans TMC – 7183 Opportunity Rd, San Diego, CA 92111 – 3 groups</td>
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<td>10/23</td>
<td>Capacity Analysis: Freeway Segments</td>
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<td>10/28</td>
<td>RESEARCH PAPER DUE and Research Presentations</td>
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<td>Capacity Analysis: Multilane Highways</td>
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<td>Capacity Analysis: Two-Lane Highways</td>
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<td>Intelligent Transportation Systems</td>
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<td>Independent Study – on-line module</td>
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<td>12/4</td>
<td>Trip Distribution and Modal Split</td>
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<td>12/9</td>
<td>Traffic Assignment. Review for the FINAL</td>
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<td>12/16</td>
<td>FINAL EXAM 8:00 a.m. – 10:00 a.m.</td>
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Subject Areas and Learning Objectives

Introduction

- Transportation and society
- Role of civil engineering in the planning, design, construction, operation and maintenance of highways

Learning Objective: This portion of the class provides some general background information on transportation. This information is intended to give the student a basic knowledge of some of the fundamental issues in transportation field with an emphasis on some cutting-edge developments and solutions.

Road Vehicle Performance:

- Tractive Effort and Resistances
- Acceleration
- Deceleration
- Braking theory

Learning Objective: The objective of this portion of the course is to give students a basic understanding of the factors influencing road vehicle performance, and its impact on road design.

Geometric Design of Highways

- Sight requirements
- Horizontal and vertical alignments

Learning Objective: The geometric design of highways is the key element in safety and critical in accident litigation. The objective of this chapter is to familiarize students with the elements involved in geometric design and the safety concerns that motivate vertical curve length and horizontal curve design.

Fundamentals of Traffic Flow and Queuing Theory

- Queuing theory
- Applied queuing models
- Traffic delay computations

Learning Objective: Queuing theory has broad impacts in transportation engineering and it builds upon student’s basic math and probability knowledge. The objective of this section is to give the student a very basic understanding of queuing theory and familiarity with the deterministic and probabilistic assumptions made for arrivals and departures.

Highway Capacity and Level of Service Analysis

- Basic Freeway segments
- Multilane Highways
- Rural two-lane highways

Learning Objective: Basic level of service analysis serves as a basis for determining highway construction needs and other transportation resource allocations. This section provides students with the knowledge needed to conduct level of service analysis, familiarity with the terminology used in such analysis, and the background needed to use Highway Capacity Manual (HCM) level of service software.

Traffic Control and Analysis at Signalized Intersections

- Traffic signal phasing
- Traffic signal timing
Learning Objective: The objective of this section is to give students a familiarity with the elements of signal timing, terminology, and signal timing theory. This material is designed to serve as a background for a more detailed study of traffic signal theory and the use of signal-timing software.

Travel Demand and Traffic Forecasting

- Traveler Decisions
- Trip Generation
- Mode and Destination Choice
- Highway Route Choice

Learning Objective: Determining and forecasting travel demand is a complicated process because it involves predictions of human behavior. This section presents various mathematical and statistical models that have been developed to predict individuals’ travel behavior and apply it in travel demand forecasts and policy studies.

Guidelines for Group Research Paper

1. Your group project will focus on contemporary Transportation challenges and solutions. The following four topics will be distributed among groups. It means that several groups will work on the same topic; there will be an opportunity to strive for the best group report. Winners in each category will receive special bonus. The topics are:

   A) Intelligent Vehicle Technologies
   B) Intelligent Highway Technologies
   C) Complete Streets
   D) Pedestrian Safety Technologies

2. Information Sources - Information is collected from library/internet sources and also from the local agencies (CALTRANS, SANDAG) and consulting firms. A number of journals available online are an excellent place to start.

3. Focus

   A) Wherever possible, try to present and critically assess international efforts/achievements in your study area.
   B) Compare American solution against the leading achievements in other countries worldwide.
   C) Comment on any promising futuristic solutions

3. Paper Structure - It is important for your paper to be well structured. Although each paper will be different, papers should have:

   A. Problem Statement, including the significance of the problem (safety? efficiency? other factors?) and who is likely to be interested in the solution to those challenges
   B. Presentation of the most important solutions (technologies, results, challenges)
   C. Evaluation of the national and international solutions (some form of an original Summary Table or Chart is encouraged)
   D. Conclusions.

4. Paper Size - The paper should be about 15 pages typed single spaced, 11 font (including figures and tables). Try to be succinct and to the point but be careful not to leave out important information.

5. Paper Grading – The paper’s grade will be based on the following components:

   a) Merit (accuracy and completeness of information, wise use of sources, originality) 70%
   b) Attractiveness of the presentation (use of pictures, tables; graphics; paper structure) 10%
   c) Language (use of English, grammar, spelling) 10%
   d) References (depth of the literature review; professional, journal-like format) 10%

Students with Disabilities

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to
contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.