CE 147
Transportation Engineering
Course Syllabus
Spring 2017
Section 01

Instructor: Dr. Ghazan Khan
E-mail: ghazan.khan@csus.edu

Lecture: Monday & Wednesday 10:30 – 11:45 a.m. (Tahoe Hall 1007)

Office Hours:
Monday/Wednesday 3:30 – 4:30 p.m., or by e-mail appointment
4015 Riverside Hall

Labs:
Section 2 - Monday 3:30 – 6:20 pm (1118D Santa Clara Hall) [Dr. David Lim]
Section 3 - Wednesday 3:30 – 6:20 pm (1118D Santa Clara Hall) [Dr. David Lim]
Section 4 - Friday 3:30 – 6:20 pm (1118D Santa Clara Hall) [Michael Shami]
CE 147 – Transportation Engineering

COURSE DESCRIPTION
This course provides a solid introduction to the principles of transportation engineering with a focus on highway engineering and traffic analysis. Particular attention is paid to roadway traffic operations and analysis, geometric analysis and design, layout considerations, and pavement design. The material learned will provide the basic skill set that will allow students to solve fundamental transportation problems that are likely to appear in professional practice and on the Fundamentals of Engineering (FE) and the Professional Engineering (PE) exams. The material also serves as foundation for future coursework in transportation should students wish to pursue further coursework in the field.

PREREQUISITES
ENGR 115 (Statistics for Civil Engineers), CE 9 (Plane and Topographic Surveying), and CE 146 (Civil Engineering Professional Practice), with grades of C- or better; CE 146 may be taken concurrently.

ACADEMIC HONESTY AND GRADING SYSTEM
Grades will be assigned in accordance with the grading policy of the University as outlined in the section entitled “Grading System” in the current copy of the university catalog. Any instance of academic dishonesty will result in a failing grade in the course and all other sanctions as applicable by the current University policy. Academic dishonesty includes, but is not limited to, copying another student’s work.

Grades will be assigned with the general guidelines shown below.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Score Range</th>
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<tbody>
<tr>
<td>A</td>
<td>Outstanding achievement</td>
<td>&gt; 90</td>
</tr>
<tr>
<td>B</td>
<td>Excellent performance; clearly exceeds course requirements</td>
<td>80 – 89</td>
</tr>
<tr>
<td>C</td>
<td>Average</td>
<td>70 – 79</td>
</tr>
<tr>
<td>D</td>
<td>Passed, but not at average achievement standards</td>
<td>60 – 69</td>
</tr>
<tr>
<td>F</td>
<td>Failure to meet course requirements</td>
<td>&lt; 60</td>
</tr>
</tbody>
</table>

For more details on these guidelines, please refer to the University Catalog Grading Policy.

GENERAL COURSE OBJECTIVES
1. Introduction to the fundamental topics in transportation engineering and traffic analysis
2. Focus on roadway traffic operations and analysis, geometric analysis and design, layout considerations, and pavement design.

SUPPORTED ABET LEARNING OUTCOMES
1. Develop the ability to apply knowledge of mathematics, science, and engineering (a)
2. Develop the ability to conduct experiments and to analyze and interpret data (b)
3. Demonstrate at a higher level the ability to function on a team (d)
4. Develop the ability to identify, formulate, and solve engineering problems (e)
5. Develop the ability to communicate effectively (g)
6. Develop an understanding impacts of engineering solutions in the global and societal context (h)
7. Introduce the recognition of need for, and ability to engage in lifelong learning (i)
8. Demonstrate at a higher level knowledge of contemporary issues (j)
9. Develop the ability to use techniques, skills and modern engineering tools (k)
SPECIFIC LEARNING OBJECTIVES

1. **Introduction** – This portion of the course provides some general background information on transportation. This information is intended to give students a basic knowledge of some of the fundamental issues in transportation and to get students thinking about transportation critically and not accept, at face value, the ideological view of transportation that is often portrayed in the popular press and espoused in political jargon.

2. **Traffic Flow and Queuing Theory** – Traffic flow models and queuing theory have broad impacts in transportation engineering and they build upon student’s basic math and probability knowledge. The objective of this section is to give the student a basic understanding of traffic flow and queuing theory and familiarity with the deterministic and probabilistic assumptions made for vehicle arrivals and departures. After completing this section, students are expected to have the tools to understand basic traffic flow and queuing principles and have the underlying basis for understanding complex queuing systems.

3. **Highway Capacity and Level of Service Analysis** – Capacity and 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 capacity and level of service analyses, familiarity with the terminology used in such analyses, and the background needed to use the *Highway Capacity Manual* (HCM) capacity and level of service analysis methods.

4. **Traffic Control and Analysis at Signalized Intersections** – The objective of this section is to give students a familiarity with the elements of signal control, signal timing, signal timing theory, and terminology. This material is designed to serve as a foundation for a more detailed study of the complexities of traffic signal theory and operation.

5. **Geometric Design** – 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. After completing this section, students are expected to have a basic understanding of curve design and stationing and have all of the tools to begin a basic design of a highway section, and the background necessary to readily begin learning a variety of computer software packages that assist in the details of highway geometric design.

6. **Pavement Design** – The objective of this portion of the course is to give students a basic understanding of the factors influencing pavement design, includes computing loading demands and adequate pavement structures to meet the demand. After completing this section, students should be able to design basic asphalt or concrete pavement sections.

**REQUIRED TEXTBOOK**

The text is available at the campus bookstore. Older versions of the textbook are not permitted as they are no longer consistent with current transportation engineering standards, such as the 2010 *Highway Capacity Manual*. 

COURSE ORGANIZATION

1. Lecture sessions will be held weekly. Students are responsible for reading the assigned material prior to the lecture session as noted on the attached schedule, including a review of the example problems within the assigned reading.

2. Each laboratory assignment will take approximately two weeks to complete. The first week typically involves collection of data and the second week involves the analysis of data and report writing. Students must attend the laboratory section on the day and time for which they are enrolled. Late lab assignments will not be accepted.

3. Exams will be conducted as noted on the attached schedule. There will be a total of two 75-minute exams and a cumulative final exam. The final exam will be given at the date and time determined by the University Final Exam Schedule.

EVALUATION OF STUDENT PERFORMANCE

Grades will be weighted as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Quizzes and Learning Modules</td>
<td>10%</td>
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<tr>
<td>Contemporary Transportation Issues</td>
<td>5%</td>
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<tr>
<td>Attendance and Class Participation</td>
<td>5%</td>
</tr>
<tr>
<td>Laboratory Participation and Reports</td>
<td>20%</td>
</tr>
<tr>
<td>Exams (2)</td>
<td>35%</td>
</tr>
<tr>
<td>Final Exam (1)</td>
<td>25%</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
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**Quizzes and Learning Modules – 5%**
Quizzes will be assigned throughout the semester to help you keep up to date with lecture and lab material. Some of the quizzes are designed to assess student learning and provide feedback on online pre-lab activities and instructions which will be shared through the class website on SacCT and all quizzes will be conducted online.

**Contemporary Transportation Issues in the News – 5%**
You are required to present a current transportation-related news story to the class. This brief presentation will require you to demonstrate your ability to communicate effectively. It will also help you gain knowledge of contemporary issues in engineering and to understanding impacts of engineering solutions in the global and societal context. You will be scheduled one day during the semester when you will give your presentation. There are no provisions to make-up your presentation if you miss it or if you forget to prepare for it.

**Attendance and Class Participation – 5%**
Class attendance is mandatory for this course. You will be permitted to miss three classes during the semester. This course is best enjoyed with active student participation and interaction. Students are expected to act in a professional manner, and persistent disruptions in class can also affect your participation grade.

**Laboratory Participation and Reports – 20%**
This course has an applied, hands-on laboratory. The laboratory assignments are designed to represent real-world transportation studies and involve collecting and analyzing data or utilizing...
state-of-the-practice software. These assignments are broad-based and will require you to conduct experiments, analyze and interpret data, and work with others in small groups. **Attendance and participation is required for all laboratories unless expressed permission is provided by Dr. Khan or your lab instructor prior to your lab section.** Failure to attend and participate in all laboratory sessions may result in an incomplete grade in the course.

**Exams (2) – 35%**

There will be two “midterm” exams around the seventh and thirteenth weeks of the semester. These exams will consist of: 1) a closed-book portion consisting of “general knowledge” fill-in questions and 2) an open-book portion consisting of problems similar in nature to the homework problems.

**Final Exam (1) – 25%**

The final exam will be similar in format to the two midterm exams. This exam will consist of an open-book portion and a closed-book portion, consisting of three to five comprehensive quantitative problems that relate to any of the material covered during the semester.

**COURSE POLICIES**

**Course Repeat Restriction (starting with fall 2017 registration)** – students will not be permitted to register for a civil engineering (i.e., prefix “CE”) course they are currently enrolled in.

**Repeating combined lecture and lab courses** – students are required to repeat both the lecture and lab activities if they receive below a C- in a combined lecture and lab civil engineering course. Combined lecture and lab courses pertinent to this policy are CE4, CE9, CE101, CE147, CE170 and CE171A.

**Attendance and Etiquette:** Classroom attendance and professional behavior are required of all class participants during all aspects of the course. Please silence your mobile communication devices while in class and lab.

**Calculator Policy:** Only current FE/EIT approved calculators will be allowed during in-class civil engineering exams. Use of an unapproved calculator will be considered an act of academic dishonesty. Per CE Department policy, the only calculators allowed for quizzes and exams are:

- Casio: All fx-115 models; any Casio calculator with fx-115 in its model name is allowed.
- Hewlett Packard: The HP 33s and HP 35s models are allowed. No other Hewlett Packard models are allowed.
- Texas Instruments: All TI-30X and TI-36X models are allowed; any Texas Instruments calculator with TI-30X or TI-36X in its model name is allowed.

Mobile communication devices may not be substituted for calculators and are strictly prohibited during all quizzes and exams. See [http://www.pels.ca.gov/applicants/calculator.shtml](http://www.pels.ca.gov/applicants/calculator.shtml).

**Make-up exams and assignments:** Late assignments will not be accepted. Make-up exams or quizzes will not be given except in unusual cases beyond the student’s control, or arranged in advance with the instructor. Grades will be given at the end of the semester based only on the work completed during the semester. Only assignments received by the due date will be eligible to receive credit.

**Collaboration:** You are encouraged to do homework assignments with a classmate. The goal of the homework is for you to learn the concepts of the course, and you will be asked to demonstrate your knowledge of these concepts on quizzes and exams. It will be in your best interest to understand all of the assigned problems, even if collaborating with other individuals.
Communication: Some features of this course, like homework solutions, will be available on SacCT (http://www.csus.edu/sacct). You must have a working SacLink account to access SacCT. If you do not have a SacLink account, you can apply for one on-line (http://www.csus.edu/saclink) or by visiting the second floor of the AIRC Building.

For more technical/conceptual questions requiring thorough explanation or discussion, please see me during office hours. If you cannot attend office hours, you are encouraged to e-mail me directly (ghazan.khan@csus.edu) to schedule an appointment. Please do not send message to me through SacCT; you may not receive a timely reply. I may also need to contact the entire class via MySacState to notify you of schedule changes or homework/lab hints. MySacState should contain or forward to the e-mail address you check most often.

Computer Access: You must have a working ECS computer login to access the lab computers. If you do not have an ECS login, apply for one on-line (http://www.ecs.csus.edu) or by visiting the second floor computer lab in Riverside Hall.

Disability Access: If you have a disability and require accommodations, please provide disability documentation to SSWD, 1008 Lassen Hall, (916) 278-6955. Please discuss your accommodation needs with me during the first week of the semester.

TENTATIVE LAB SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Lab 1 - Resume and On-Line Profile</td>
</tr>
<tr>
<td>2 – 4</td>
<td>Lab 2 - Speed and Compliance Survey</td>
</tr>
<tr>
<td>5 – 7</td>
<td>Lab 3 - Uninterrupted Level of Service</td>
</tr>
<tr>
<td>8 – 10</td>
<td>Lab 4 - Intersection Delay and Level of Service</td>
</tr>
<tr>
<td>12</td>
<td>Lab 5 - Alignments and Facilities Design</td>
</tr>
<tr>
<td>14</td>
<td>Lab 6 - Pavement Design</td>
</tr>
<tr>
<td>15</td>
<td>Lab 7 – Intercept Survey</td>
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</tbody>
</table>

1 Please use professional e-mail etiquette and grammar when corresponding to University faculty and staff. We are here to help you develop both your engineering skills and your communication skills!