

<b>Course number</b>	CE 351
<b>Title</b>	Introduction to Transportation Engineering
<b>Section</b>	001
<b>CRN(s)</b>	60584
<b>Credits</b>	4.000
<b>Prerequisite(s)</b>	STAT 451 and junior standing in engineering
<b>Days/time</b>	Tuesday/ Thursday 8:15–10:05 AM
<b>Location</b>	Fourth Ave Building 46
<b>Final exam session</b>	Monday, June 12; 8:00–9:50 AM

<b>Course website</b>	<a href="https://d2l.pdx.edu/">https://d2l.pdx.edu/</a> Check D2L regularly to find the syllabus, assignments, announcements, class slides, readings, etc.
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<b>Instructor</b>	Professor Kelly J. Clifton, PhD
<b>Office</b>	301E Engineering Building
<b>Phone</b>	503-725-2871
<b>Email</b>	kclifton@pdx.edu
<b>Office hours</b>	Tuesday 10–11 AM or by appointment
<b>Mailbox location</b>	CEE Office, Room 201A, Engineering Building (open 8–5 daily)

<b>Grader</b>	TBD
<b>Required text</b>	Mannering, F. L., & Washburn, S. S. (2012). <i>Principles of Highway Engineering and Traffic Analysis</i> (5 <sup>th</sup> ed.). Hoboken, NJ: Wiley. ISBN 9781118120149. <ul style="list-style-type: none"> <li>Chapters 1–6. (Chapters 7–8 covered in CE 454)</li> </ul>

**Recommended and supplemental texts, readings, references, and resources:**

- *Highway Capacity Manual* (HCM). Transportation Research Board, 2010. <http://hcm.trb.org/>
- *A Policy on Geometric Design of Highways and Streets* (6<sup>th</sup> ed.) (AASHTO Green Book). American Association of State Highway and Transportation Officials, 2011. [https://bookstore.transportation.org/collection\\_detail.aspx?ID=110](https://bookstore.transportation.org/collection_detail.aspx?ID=110)
- *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), Federal Highway Administration, 2009. <http://mutcd.fhwa.dot.gov>
- *Highway Design Manual*. Oregon Department of Transportation, 2012. [http://www.oregon.gov/ODOT/HWY/ENGSERVICES/Pages/hwy\\_manuals.aspx](http://www.oregon.gov/ODOT/HWY/ENGSERVICES/Pages/hwy_manuals.aspx)
- *Urban Street Design Guide*. National Association of City Transportation Officials, 2013. <http://nacto.org/publication/urban-street-design-guide/>
- *Protocol for VISSIM Simulation (VISSIM)*, Oregon Department of Transportation, 2011. <http://www.oregon.gov/ODOT/TD/TP/APM/AddC.pdf>

**Course catalog description:**

A study of engineering problems associated with the planning and design of urban and intercity transportation with emphasis on systems approach to problem definition and solution. Vehicle operational characteristics and traffic control devices for land, air, and water, data collection methods and development of transportation models for the establishment of design criteria for transportation structures.

**Course statement:**

This course is an introduction to the principles of transportation engineering with a focus on roadway design and traffic analysis. Topics include vehicle performance, geometric design, pavement design, traffic flow, and capacity analysis. Linkages to beyond the highway mode are included. The material learned will allow students to solve transportation problems that are likely to appear in professional practice and on the Fundamentals of Engineering (FE) and Principles and Practice of Engineering (PE) exams.

**Course objectives:**

Students must demonstrate the ability to:

1. Understand how transportation systems and the various modes of transportation fit into the civil infrastructure and society.
2. Communicate an awareness of basic transportation issues.
3. Understand the basic physical concepts that impact vehicle/infrastructure interactions and their effects on transportation system users.
4. Design roadway horizontal and vertical curves using AASHTO guidelines.
5. Understand and apply traffic flow and queuing theory to transportation problems.
6. Understand basic highway capacity principles and analyze the capacity of transportation facilities.
7. Become familiar with social and sustainability impacts of transportation systems.

**Course requirements:**

Students are required to:

- Regularly check D2L for assignments, lecture materials, handouts, supplemental readings, other materials, and announcements.
- Be engaged and participate actively in class discussions.
- Complete in-class exercises.
- Complete assigned readings prior to the relevant class.
- Complete all homework assignments.
- Complete the lab assignment.
- Take and pass the midterm exam and the final exam.
- Give all written responses in your own words, and submit your own work.

**Course grading:**

The course grade will be determined with the following weights for class assignments:

<b>Assignment</b>	<b>Weight</b>
Class participation	5%
In-class exercises	15%
Homework assignments	20%
Lab assignment	10%
Midterm exam	25%
Final exam	25%
Total	100%

*Note*

A grade of incomplete "I" is granted by the instructor only with prior approval and consent. Criteria are outlined in the PSU Bulletin. Note that for Civil Engineering Undergraduates the CEE Department requires that junior and senior engineering courses must be completed with a minimum grade of C-, and a student's cumulative PSU GPA must be 2.25 or higher to graduate from the BSCE program.

**Description of assignments:**

*Class participation (5%)*

Students are expected to actively engage in class and in the learning experience. This includes regular attendance, completing readings prior to class, asking questions, providing examples and commentary, participating in small group activities, and positively contributing to the intellectual environment of the classroom.

- If you must miss a class due to an excused absence (e.g., conference, government obligation, family emergency), please email the instructor in advance to discuss alternative arrangements.

*In-class exercises (20%)*

Periodically, problems will be assigned to be worked on and completed during the class time. These exercises must be turned in at the end of class; they will be graded. The exercises will generally be shorter or of less effort than the homework assignments, but they will be more frequent. In order to successfully complete the in-class exercises, it is important to do the readings before class, pay attention and active during lectures, and bring your textbook, calculator, and writing implements to class every day.

- You may make up/replace each of up to two in-class exercise grades (due to excused absences) by attending the Friday Transportation Seminar (<http://trec.pdx.edu/professional-development>) and writing a two paragraph recap summarizing the talk and discussing how it influences the profession of transportation engineering.

*Homework assignments (20%)*

Problem sets and homework assignments will be posted on the course website or assigned during the class session. Unless otherwise noted, assignments are due one week from when they are assigned at the beginning of class. Some specific notes about homework:

- Homework assignments are to be written or typed on letter-sized paper. Use care and ensure that the TA can read your writing. Use clearly legible engineering-style block lettering, do not crowd your writing, and maintain professional presentation standards.
- Place your name, the course number (CE 351), assignment number, and due date on the header of each page, in case they get separated. Staple pages together in the upper left hand corner and please do not fold the pages. Also, please write your name in large capital letters on the back of the completed assignment; this will make handing them back easier.
- For calculation problems, partial credit is available. Half (50%) of your grade will be based on whether or not you have the correct answer. Draw a box around your final answer(s) for clarity. The other half (50%) of your grade will be based on having the correct process for solving the problem. In order to get full credit, you must clearly restate the problem, including any inputs and assumptions, and include all formulas and intermediate calculations. Show your work!
- For short-answer or multiple-choice questions, all (100%) of your grade will be based on whether or not you have the correct answer.
- For essay questions, all (100%) of your grade will be based on the extent to which you address the questions, the thoroughness and thoughtfulness of your response,

and the quality of your writing. Please use complete sentences and standard grammar and spelling.

- You should consider the textbook problems as a playground for you to use to learn the material. The instructor has the solutions to all problems so feel free to do more than just the assigned problems and seek out the solutions.

#### *Lab assignment (5%)*

There will be one lab assignment using VISSIM traffic simulation software. Detailed information on the assignment will be provided after the midterm.

#### *Midterm (25%) and final (25%) exams*

There will be one midterm exam and one non-comprehensive final exam. Each will cover all of the topics discussed up to the exam day or as otherwise indicated. Unless otherwise instructed, exams will be closed book, although you may bring one letter-sized piece of paper (front and back) of notes with you to the exams.

### **Student expectations**

#### *Professionalism*

The classroom is a professional space and professional conduct is expected. Treat your fellow students, the instructor, and the TA with respect, and use appropriate language at all times. Silence your phone and refrain from messaging during class and exam times. All class assignments, communications, and class participation should be conducted in a professional manner. Attention to detail on assignments and communication is an important skill and is part of the learning experience.

#### *Attendance*

Attendance is required. If you miss a class session, it is your responsibility to check D2L for any materials and to check with a classmate for any announcements or other information not posted on D2L.

#### *Submission*

The due date for each assignment will be clearly indicated and the assignment must be submitted by/at the beginning of the class session (unless instructed otherwise). Assignments that are submitted late will be penalized 25%; assignments submitted after homework is returned (usually within one week) will receive 0%. Turn in assignments in class unless instructed otherwise (e.g., via email or D2L). Do not leave assignments under doors or in mailboxes. (We are required to comply with the Family Education Rights & Privacy Act [FERPA].)

#### *Grading*

The instructor and the TA will make all efforts to return graded homework and exams promptly. As a general rule, questions about homework scoring should be discussed with the TA. The TA will work with the instructor to resolve cases that are in dispute only if the problem has not been resolved. Retain all of your notes, graded assignments, and exams.

#### *Communication*

Check your PSU email address and D2L regularly for course announcements, reminders, and updates. Email is the best way to contact the instructor and the TA. Please include the course number (CE 351) in the subject line. Use professional and polite communication standards, a salutation, valediction/closing, proper grammar, spell check, and proof your message before hitting send.

### *Computer accounts*

All engineering students should activate their CECS computer account which will allow them to use engineering computer labs and email. You should activate it before the day you need it. If you encounter problems with your account, see a lab attendant, or send an email to [support@cecs.pdx.edu](mailto:support@cecs.pdx.edu). The CEE Department also regularly sends course announcements, job information, etc. to students' CECS accounts, so you may want to forward your CECS email to whatever email address you most often use.

### *Ethics*

As future professional engineers, you should plan to take the Fundamentals of Engineering Exam (see the National Council of Examiners for Engineering and Surveying at <http://ncees.org/>) and, after the required experience, the Principles and Practice of Engineering Exam (see the Oregon State Board of Examiners for Engineering and Land Surveying at <http://www.oregon.gov/OSBEELS/>). You should also be familiar with the ASCE Code of Ethics (<http://www.asce.org/code-of-ethics/>), which includes the following: Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession.

### *Code of conduct*

The PSU Student Conduct Code prohibits all forms of academic cheating, fraud, and dishonesty. Further details can be found in the PSU Bulletin. Allegations of academic dishonesty may be addressed by the instructor, and/or may be referred to the Office of Student Affairs for action. Acts of academic dishonesty may result a failing grade on the exam or assignment for which the dishonesty occurred, disciplinary probation, suspension or dismissal from the University. The students and the instructor will work together to establish optimal conditions for honorable academic work. Questions about academic honesty may be directed to the Office of Student Affairs (<http://www.pdx.edu/dos/psu-student-code-conduct>).

## **Resources**

### *Student groups*

Participation in student groups can be a valuable part of your educational experience. Membership affords opportunities to get to know your fellow students better, meet and network with professionals, collaborate in solving real engineering problems, learn about internship or job possibilities, socialize and have fun. Your fellow students can be a great source of help and guidance in your academic endeavors. Consider becoming active with a student organization (<http://www.pdx.edu/cee/student-groups>), such as the following:

- American Society of Civil Engineers (ASCE) student chapter
- American Water Works Association (AWWA) student chapter
- Bridges 2 Prosperity (B2P) student chapter
- Construction Management Association of America (CMAA) student chapter
- Engineers Without Borders (EWB) student chapter
- Society of Women Engineers (SWE)
- Students in Transportation Engineering and Planning (STEP), the Institute of Transportation Engineers (ITE) student chapter (<http://www.step.groups.pdx.edu/>)
- Women's Transportation Seminar (WTS) student chapter (<https://www.wtsinternational.org/portlandstateuniversity/>)

### *Professional organizations*

Most professional organizations have monthly meetings and encourage student participation by providing discounts for lunch and dinner meetings. These meetings provide opportunities to network with potential future employers, learn about scholarships, internships, and jobs, and increasing your technical knowledge. Some of these organizations include:

- American Society of Civil Engineers (ASCE) Oregon section (<http://www.asceor.org/>)
- Institute of Transportation Engineers (ITE) Oregon section (<http://www.oregonite.org/>)
- Society of Women Engineers (SWE) Columbia River section (<http://columbiariver.swe.org/>)
- Structural Engineers Association of Oregon (SEAO) (<https://www.seao.org/>)
- Women’s Transportation Seminar (WTS) Portland section (<http://www.wtsinternational.org/portland/>)
- Young Professionals in Transportation (YPT) Portland section (<http://yptransportation.org/chapters/portland/>)

#### *Research opportunities*

Transportation is an exciting and growing area of research and scholarship at Portland State University. CEE faculty, research associates, and research assistants participate in the campus-level Transportation Research and Education Center (TREC) for Portland State University (<http://trec.pdx.edu/>), which houses the National Institute for Transportation and Communities (NITC) (<http://nitc.trec.pdx.edu/>), a USDOT-funded National-level University Transportation Center. TREC also hosts the Friday Transportation Seminar Series (<http://trec.pdx.edu/professional-development>) with weekly guest speakers during the school year. In addition, CEE faculty direct several research labs, including the Transportation Technology and People lab (<http://www.pdx.edu/transportation-lab/>) and the Oregon Modeling Collaborative (<http://www.pdx.edu/omc/>).

#### *Campus help*

As a PSU student, you have numerous resources at your disposal. Please take advantage of them while you are here. A small sample is listed below:

- CEE website (includes program info, job listings, etc.) (<http://www.pdx.edu/cee/>)
- Maseeh Student Services (<http://www.pdx.edu/cecs/maseeh-student-services>)
- Advising and Career Services (<http://www.pdx.edu/advising-career-services/>)
- Center for Student Health & Counseling (<http://www.pdx.edu/shac/>)
- The Writing Center (<http://www.writingcenter.pdx.edu/>)
- Disability Resource Center (<http://www.pdx.edu/drc/>) – The PSU Disability Resource Center is available to help students with academic accommodations. If you are a student who has need for test-taking, note-taking or other assistance, please visit the DRC and notify the instructor at the beginning of the term.

#### *Library and academic literature*

With the advent of the Internet it is very tempting to think that all necessary resources for a term project will be available in full text after Googling a few words. This is not the case. You will often need to go to the library, use real library search tools, and access real books and articles contained in refereed/archival journals. The PSU Library (<http://library.pdx.edu/>) is the best starting place to search for and access physical and electronic books, journals, etc. There is an excellent guide to transportation topics available (<http://guides.library.pdx.edu/transportation>).

#### *Campus safety and security*

Call **911** if there is an emergency. The University considers student safety paramount. The Campus Public Safety Office (<https://www.pdx.edu/cpso/>) is open 24 hours a day to assist with personal safety, crime prevention and security escort services. Call 503-725-4407 for more information. **For Campus emergencies call 503-725-4404.** CPSO is located at 633 SW Montgomery Street.

#### *Final notes*

The syllabus is subject to change at any time.

**Course schedule**

Opportunities may arise during the term (e.g., guests, field trips) so the topics/dates may change as necessary. Attend class and check D2L frequently to stay informed.

Wk.	Day/Date	Topic	Reading
1	Mon. 3-Apr	Course introduction; Transportation systems, etc.	1.1-1.7
	Wed. 5-Apr	Road-vehicle-driver performance, safety	2.1–2.5
2	Mon. 10-Apr	Braking	2.9
	Wed. 12-Apr	Geometric design - Vertical Alignment	3.1-3.3
3	Mon. 17-Apr	Geometric design - Vertical Alignment	3.3
	Wed. 19-Apr	Geometric design - Horizontal Alignment	3.4
4	Mon. 24-Apr	Geometric design - professional context	
	Wed. 26-Apr	Geometric design - Horizontal Alignment	3.4
5	Mon. 1-May	Signage and striping design, MUTCD	MUTCD
	Wed. 3-May	Review for midterm	(study)
6	Mon. 8-May	Midterm exam	(study)
	Wed. 10-May	Traffic Flow Theory	5.1-5.4
7	Mon. 15-May	Traffic Flow Theory	5.1-5.4
	Wed. 17-May	Traffic Flow Theory/Highway Capacity	6.1-6.3
8	Mon. 22-May	Highway Capacity - Freeways	6.4
	Wed. 24-May	Highway Capacity - Freeways/Multilane Highways	6.5-6.6
9	Mon. 29-May	Highway Capacity	6.5-6.6
	Wed. 31-May	Intro to VISSIM Simulation/Future directions in transporta	
10	Mon. 5-Jun	VISSIM Lab	VISSIM
	Wed. 7-Jun	VISSIM Lab	VISSIM
11	Mon. 12-Jun	Final exam	(none)