

CE 321

Highway Engineering

Lecture: TBA; Lab: TBA

Instructor Information:

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Course description:

This course will provide you with an introduction to the field of transportation engineering, including the significance and role of transportation in society and within the civil engineering profession. The primary focus will be on highways and surface transportation modes, however other modes will be briefly discussed throughout the semester. The course will also provide you with the fundamentals necessary to solve highway engineering problems encountered on the Fundamentals of Engineering (FE) and Principles of Engineering (PE) exams in civil engineering.

The specific topics covered in this course will include:

1. Vehicle performance characteristics
2. Geometric design, including horizontal and vertical curve design
3. Pavement design
4. Traffic flow principles and queuing theory
5. Capacity and Level of Service analysis
6. Transportation planning

Course overview:

This course will be split into two components: lectures and a laboratory. The lecture sessions will introduce the major course material and follow closely from the course textbook. The laboratory component will consist of a set of exercises that encompasses many phases of the preliminary design process. More information will be provided during the laboratory session.

Grading:

Your evaluation in this course will be based upon the completion of regular problem sets, quizzes, a final exam and a series of laboratory assignments. A breakdown of the grading is as follows:

Problem sets	25%
Quizzes	25%
Final exam	25%
Laboratory	25%

Problem sets: Problem sets based on the lecture material will be assigned during lecture periods. Your problem set submissions must be turned in online on Canvas when they are due—late problem sets will only be accepted until the solutions are posted and a **10% per day late penalty** will be applied. You may discuss homework assignments in small groups (no more than two other people). However, all submissions must reflect your own understanding of the material. If you have discussed the problem sets with anyone else, please acknowledge that person on your submission. Exact copies of other problem set submissions without acknowledgement will be considered as a violation of academic integrity. To receive full credit for any assignment, be sure to write legibly, clearly state all assumptions for given problems, provide orderly problem calculations, and clearly identify final solutions (including units). An example of a recommended format for a problem set will be posted on Canvas prior to the first assignment. **Your lowest problem set grade will be dropped for final grading.**

The grading rubric for problem sets will be as follows:

- To receive a grade of 10/10 you must:
 - Show effort to solve all the problems
 - Have the correct answer for at least 3 of the problems
- To receive a grade of 8/10 you must:
 - Show effort to solve all the problems
 - Have the correct answer for at least 1 problem
- To receive a grade of 6/10 you must:
 - Show effort to solve at least 3 problems
- Otherwise, you will receive a grade of 0/10

Quizzes: Four **Canvas** quizzes will be given during the course of the semester. The course content covered on each quiz will be announced prior to the quiz date. You will be permitted to use your course textbook and notes during the quizzes, and calculators will be required. **Your lowest quiz grade will be dropped for final grading.**

Final exam: A final exam will be administered during the regular final exam period. The final exam will be **comprehensive** and cover all content included in the course during the semester. You will be permitted to use your course textbook and notes during the final exam, and calculators will be required.

Laboratory assignments: The laboratory component of this course will contain a set of weekly exercises and assignments that will teach you how to use AutoCAD Civil 3D to perform various phases of the preliminary highway design process. The laboratory periods will each contain a lecture that will focus on the instructions required to complete the assignments and time to perform some of the necessary activities. The commands required to complete the tasks will also be outlined in weekly course packages. Many of the design decisions will be left up to you. Failure to make substantial progress each week will reflect on your final project grade. Habitual absence during the lab periods WILL result in a lower grade for the laboratory component.

Course Textbook:

Recommended: Mannering, F.L. and Washburn, S. S. Principles of Highway Engineering and Traffic Analysis, sixth edition. John Wiley and Sons, 2017.

Canvas

General course information will be posted on Canvas (canvas.psu.edu), along with lecture and lab materials and homework solutions.

Academic integrity

“Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.”

From Penn State's University Faculty Senate Policy 49-20

Disability disclaimer

“Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at <http://equity.psu.edu/ods/>.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at <http://equity.psu.edu/ods/guidelines/documentation-guidelines>). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

Course schedule

The following is a list of topics to be covered during the semester. Note that some topics will span multiple classes.

Reading	Topic
Chap. 1	Course introduction; highway engineering
Chap 2.1-2.5	Vehicle performance and resistance
Chap 2.6-2.7	Tractive effort and vehicle acceleration
Chap 2.9	Vehicle braking
Chap 2.9	Practical Stopping Distance
Chap 3.1,3.2,3.4	Geometric design
Chap 3.4	Horizontal curves
Chap 3.3	Vertical curves
Chap 4.1-4.4	Flexible pavement design
Chap 5.1-5.3	Traffic stream parameters
Chap 5.5	Traffic flow and queueing
Chap 6.1-6.4	Freeway capacity and LOS
Chap 6.5	Multi-lane highway
Chap 6.6	Two-lane highway
Chap 8.1-8.4	Intro to transportation planning
Chap 8.4-8.5	Destination mode choice and route choice