CE 4720/5720: Street and Highway Design
Spring 2025

Course and Instructor Information

Course title:	Street and Highway Design
Credits:	3
Mode/Format:	In-Person
Prerequisites:	CE 2710
Recommended preparation:	CE 4410
Class time:	Tue -Thu 11:00 AM-12:15 PM (CAST 205)
Office hours:	Tue -Thu 12:15-1:15 PM (location: CAST 319) + by request
TA office hours:	Fri 11:00 AM-1:00 PM (location: CAST 210)

Professor/Instructor:	Dr. Fatemeh FakhrMoosavi
Pronouns:	she/her/hers
Email:	moosavi@uconn.edu (Preferred method of contact)
Telephone:	Office 860-486-0548
Office hours/availability:	Tue -Thu 12:15-1:15 PM (location: CAST 319 unless the student requests an online office hour by email. Please feel free to request extra office hours.)
Teaching assistant:	Devin Rhoads
TA email:	devin.rhoads@uconn.edu
TA office hours:	Tue 2:00-4:00 PM (location: CAST 210)

Course Materials

Recommended References:

- AASHTO Green Book: A Policy on Geometric Design of Highways and Streets, *American Association of State Highway and Transportation Officials (AASHTO)*, 6th Edition, 2011.
- Highway Design Manual, Connecticut Department of Transportation, 2003 Edition
- Lecture notes, which will be posted periodically online for students to download.

Additional References:

- Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), Fed. Highway Admin., 2009
- Highway Capacity Manual, Transportation Research Board, 2010
- Roadside Design Guide, 4th Edition, AASHTO, 2011
- Older Driver Highway Design Handbook, Federal Highway Administration, 2nd Edition, 2014
- A User's Guide to Positive Guidance, 3rd Edition, Federal Highway Administration, 1990

Course Scope

This course aims to explore the principles, methods, and practical aspects involved in designing streets and highways in the United States, while adhering to applicable standards and guidelines. The topics to be covered include various design components, such as human, vehicle, and traffic elements, as well as sight distance, geometric design, cross-sectional design element, intersection design, traffic control, and traffic calming.

Course Goals

The primary objective of this course is to equip students with a comprehensive comprehension of the principles, concepts, and techniques utilized in the design of streets and roadways in the United States. By the end of the course, students will be able to apply the current highway design standards to create different types of roadway facilities.

Course Objectives

By the end of the semester and upon the successful completion of this course, students will be able to:

1. Apply the sequential process to the design of a highway.
2. Explain what (and how) issues govern a highway design, such as, sight distances, design vehicles, and driver characteristics.
3. Determine the geometric elements of a highway, such as horizontal alignment, vertical alignment, and cross-sections.
4. Develop and explain the impact that one geometric feature has on another geometric feature, such as the impact of frictional forces on turning or stopping a vehicle.
5. Use codes and standards for highway design.
6. Effectively communicate the advantages and disadvantages of different geometric configurations.
7. Explain the impact of geometric cross-sections on highway accident rates.
8. Assess the advantages and disadvantages of the risks associated with guardrail design.
9. Apply material related to assigned readings related to highway design.
10. Contribute to the successful completion of a highway design project.
11. Present a highway design project.

Course Requirements and Grading

Summary of Course Grading:

Course Components	Weight
Homework Assignments	25%
Design Project	25% (20% project, 5% presentation/video)
Midterm Exam	25%
Final Exam	25%
Extra Credits (Seminar Attendance + Quizzes)	5%

Homework Assignments
There will be a total of 5 homework assignments throughout the course. Homework assignments must be handed in at the beginning of the class time on the date they are due**. No late homework will be accepted unless otherwise noted by the instructor.** Students are encouraged to share ideas for homework assignments, but every student should return a separate assignment (This is not the case for projects). Note that just ideas can be shared and identical answers (using same parameters and variables, or similar calculation mistakes) for any question is not acceptable and will be considered as cheating.

Course Project
The project will be performed in groups of 3-4 and will be assigned prior to mid-semester. The project will be design-oriented and will include a set of professional CAD drawings and a presentation at the end of the semester. Each group shall also submit a final report. The report for each group should be no more than 12 typewritten pages (double spaced and inclusive of figures and tables). Students may present their projects in the class or choose to record a video and submit.

Examinations
Two course examinations are expected, one near midterm and the other in the final week. Students are allowed to bring printed lecture slides and the AASHTO Green book to the exam. Students are not allowed to share notes, ideas, or calculators during the exams.

Class Participation
Students are encouraged to contribute to each class's lecture. Participation in course discussions helps students to understand the course material in class and activates the upper levels of bloom's taxonomy.\

Tentative Course Outline and Class Meeting Schedule

Note 1: Guest lecture dates might be replaced with other sessions and shift all session schedule.
Note 2: The following table is a tentative plan and might be changed depending on the class activities.

Session	Date	Topics to be Covered
1	Session 1	Introduction
2	Session 2	Overview of US Transportation Systems, Policy, and Organizations
3	Session 3	Highway Functions
4	Session 4	Design Controls and Criteria- Vehicle Characteristics Affecting Roadway Design
5	Session 5	Design Controls and Criteria - Role of Human Factors in Design
6	Session 6	Design Controls and Criteria – Traffic Characteristics and Speeds
7	Session 7	Cross Section Elements
8	Session 8	Highway Capacity and Level of Service
9	Session 9	Capacity Analysis for Freeway and Multilane Roadway Segments
10	Session 10	Elements of Design - Braking and Sight Distances
11	Session 11	Elements of Design - Vertical Curves Design and Layout
12	Session 12	Elements of Design – Horizontal Curves Design and Layout
13	Session 13	Midterm Review
14	Session 14	Midterm
15	Session 15	Elements of Design – Horizontal Curves Design and Layout
16	Session 16	Guest Lecture (It might be replaced with another date)
17	Session 17	Roadway Design Steps, Highway Surveys and Drawings, Location Selection
18	Session 18	Intersection Design
19	Session 19	Intersection Design
20	Session 20	Intersection Sight Distance
21	Session 21	Guest Lecture (It might be replaced with another date)
22	Session 22	Designing for Pedestrians and Bicyclists and Traffic Calming
23	Session 23	Traffic Calming
24	Session 24	Interchanges - Warrants and Types
25	Session 25	Interchange and Ramp Design
26	Session 26	Project Presentations
27	Session 27	Project Presentations

Grading Scale:

Grade	Letter Grade	GPA
93-100	A	4.0
90-92	A-	3.7
87-89	B+	3.3
83-86	B	3.0
80-82	B-	2.7
77-79	C+	2.3
73-76	C	2.0
70-72	C-	1.7
67-69	D+	1.3
63-66	D	1.0
60-62	D-	0.7
<60	F	0.0

Due Dates and Late Policy
All course due dates are identified in the syllabus. Deadlines for the project and homework deliverables are at 11:00 AM EST on the date they are due. *The instructor reserves the right to change dates accordingly as the semester progresses. All changes will be communicated in an appropriate manner.* Ten points (from 100 points of that deliverable) will be deducted per day of late submission. Students should notify the instructor about the conflicts of any deadline or exam with a major religious holiday at least two weeks prior to the deadline or exam date.

Feedback and Grades
I will make every effort to provide feedback and grades in the week after submission. To keep track of your performance in the course, refer to My Grades in HuskyCT.

Weekly Time Commitment
You should expect to dedicate 6 to 8 hours a week out of class to this course. This expectation is based on the various course activities, assignments, and assessments and the University of Connecticut's policy regarding credit hours.

Important Dates

Feb 04: HW #1 submission
Feb 18: HW #2 submission
Mar 04: HW #3 submission
Mar 06: Midterm exam
Mar 25: HW #4 submission
Apr 08: HW #5 submission
Apr 22: Project report submission
Apr 22 & 24: Project presentations
TBD: Final exam

These due dates are tentative. Students will be notified by email and on HuskyCT if any due date changes.

Students should notify the instructor about the conflicts of any deadline or exam with a major religious holiday at least two weeks prior to the deadline or exam date.

How to Succeed in this Course

All students can succeed in this course, and we are here to help you along the way. Please do not hesitate to ask questions or attend office hours. All questions are important here. Success in this course program depends heavily on your personal health and well-being. Recognize that stress is an expected part of the college experience, and it often can be compounded by unexpected setbacks or life changes outside the classroom. I strongly encourage you to reframe challenges as an unavoidable pathway to success. Reflect on your role in taking care of yourself throughout the semester, before the demands of exams and projects reach their peak. Please feel free to reach out to me about any difficulty you may be having that may impact your performance in your courses or campus life as soon as it occurs and before it becomes too overwhelming. In addition to your academic advisor, I strongly encourage you to contact the many other support services on campus that stand ready to assist you. Here are some helpful links: Dean of Students Office, Academic Achievement Center, Writing Center, Quantitative Learning Center, Center for Students with Disabilities, Title IX Office, Student Health and Wellness -- Mental Health.

The Fundamentals of Engineering Exam

The Fundamentals of Engineering Exam (FE) is a 6-hour, 110-question computerized multiple choice exam that is typically taken by engineering students during the final year of undergraduate study. Passing the FE is a required step towards becoming a licensed professional engineer and will also make for a more attractive resume when searching for a job. Students may choose from one of seven discipline-specific tests, including FECivil and FE-Environmental. The exam can be taken at any Pearson Vue testing center (http://ncees.org/exams/testcenter-locations/), with the nearest center located at 3390 Pine Tree Road in Lansing. Additional information about the FE may be found at: http://ncees.org/engineering/fe/.

Resources for Students Experiencing Distress

The University of Connecticut is committed to supporting students in their mental health, their psychological and social well-being, and their connection to their academic experience and overall wellness. The University believes that academic, personal, and professional development can flourish only when each member of our community is assured equitable access to mental health services. The University aims to make access to mental health attainable while fostering a community reflecting equity and diversity and understands that good mental health may lead to personal and professional growth, greater self-awareness, increased social engagement, enhanced academic success, and campus and community involvement.

Students who feel they may benefit from speaking with a mental health professional can find support and resources through the **Student Health and Wellness-Mental Health** (SHaW-MH) office. Through SHaW-MH, students can make an appointment with a mental health professional and engage in confidential conversations or seek recommendations or referrals for any mental health or psychological concern.

Mental health services are included as part of the university's student health insurance plan and also partially funded through university fees. If you do not have UConn's student health insurance plan, most major insurance plans are also accepted. Students can visit the **Student Health and Wellness-Mental Health located in Storrs on the main campus in the Arjona Building, 4th Floor,** or contact the office at **(860) 486-4705, or https://studenthealth.uconn.edu/** for services or questions**.**

Accommodation for Illness or Extended Absences

Please stay home if you are feeling ill and please go home if you are in class and start to feel ill. If illness prevents you from attending class, it is your responsibility to notify me as soon as possible. You do not need to disclose the nature of your illness, however, you will need to work with me to determine how you will complete coursework during your absence.

If life circumstances are affecting your ability to focus on courses and your UConn experience, students can email the Dean of Students at dos@uconn.edu to request support. Regional campus students should email the Student Services staff at their home campus to request support and faculty notification.

COVID-19 Specific Information: People with COVID-19 have had a wide range of symptoms reported – ranging from mild symptoms to severe illness. These symptoms may appear 2-14 days after exposure to the virus and can include:

- Fever
- Cough
- Shortness of breath or difficulty breathing
- Chills
- Repeated shaking with chills
- Muscle pain
- Headache
- Sore throat
- New loss of taste or smell

Additional information including what to do if you test positive or you are informed through contract tracing that you were in contact with someone who tested positive, and answers to other important questions can be found here: https://studenthealth.uconn.edu/updates-events/coronavirus/

Mask and Social Distancing Expectations

Refer to UConn Campus Guidelines for ongoing updates.

Please be respectful of the wishes of those who prefer to maintain social distancing. For their own protection, unvaccinated individuals are requested to maintain 6 feet social distancing from others.

Copyright Statement

"Students are authorized to take notes in my class; however, this authorization extends only to making one set of notes for your own personal use and no other use. I will inform you as to whether you are authorized to record my lectures at the beginning of each semester. If you are so authorized to record my lectures, you may not copy this recording or any other material, provide copies of either to anyone else, or make a commercial use of them without prior permission from me."

Students with Disabilities

The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020 or http://csd.uconn.edu/. All session lectures will be recorded and videos with captions will be provided on HuskyCT.

Inclusion Statement

I, as the instructor of this course, am committed to fostering an inclusive and supportive learning environment where all students feel valued and empowered to succeed. This course embraces diverse perspectives, learning styles, and backgrounds, ensuring that each student has the opportunity to engage meaningfully with the material. If you encounter challenges or have specific needs, please feel free to reach out to me or the TA so we can work together to create a learning experience that supports your success.

Software/Technical Requirements (with Accessibility and Privacy Information)

The software/technical requirements for this course include:

- Equipment Recommendations (https://remotework.uconn.edu/equipment-recommendations/)
- HuskyCT/Blackboard (HuskyCT/ Blackboard Privacy Policy)
- Adobe Acrobat Reader (Adobe Reader Accessibility Statement, Adobe Reader Privacy Policy)
- Google Apps (Google Apps Accessibility, Google for Education Privacy Policy)
- Microsoft Office (free to UConn students through UConn Software Catalog) (Microsoft Accessibility Statement, Microsoft Privacy Statement)
- Dedicated access to high-speed internet with a minimum speed of 1.5 Mbps (4 Mbps or higher is recommended).
- WebCam

NOTE: This course has NOT been designed for use with mobile devices.

Privacy Statement: For information on managing your privacy at the University of Connecticut, visit the University's Privacy page.

Technical and Academic Help

Technical and Academic Help provides a guide to technical and academic assistance.

This course uses the learning management platform, HuskyCT. If you have difficulty accessing HuskyCT, you have access to the in person/live person support options available during regular business hours through the Help Center. You also have 24x7 Course Support including access to live chat, phone, and support documents.

Student Technology Training

Student technology training is now available in a new HuskyCT short course created by students for students. It will prepare you to use the IT systems and services that you will use throughout your time at UConn, whether learning online or on-campus. It is available at https://lms.uconn.edu/ultra/courses/_80016_1/cl/outline .

Minimum Technical Skills

To be successful in this course, you will need the following technical skills:

- Use electronic mail with attachments.
- Save files in commonly used word processing program formats.
- Copy and paste text, graphics, or hyperlinks.
- Work within two or more browser windows simultaneously.
- Open and access PDF files.
- Use Microsoft Word and PowerPoint.

Evaluation of Course Experience

Students will be given an opportunity to provide feedback on their course experience and instruction using the University's standard procedures, which are administered by the Office of Institutional Research and Effectiveness (OIRE).

The University of Connecticut is dedicated to supporting and enhancing teaching effectiveness and student learning using a variety of methods. The Student Evaluation of Teaching (SET) is just one tool used to help faculty enhance their teaching. The SET is used for both formative (self-improvement) and summative (evaluation) purposes.

Instructor will also ask students' feedback on the materials and teaching style twice in the semester (anonymously) to improve teaching material and style.