



School of Engineering
*Sonny Astani Department
of Civil and Environmental
Engineering*

CE 430: SUSTAINABLE TRANSPORTATION

Term: Spring 2024, Section 29640
Units: 2
Day: Friday 10:00-11:50am Pacific Time
Location: KAP138

Instructor: [Eric C. Shen, P.E., PTP, CPE](#)
Adjunct Professor of Civil & Environmental
Engineering Practice

Office: Virtual Office

Office Hours: TBD

Contact Info: ericshen@usc.edu

University Catalogue Description

Methods to apply sustainability practices building and maintaining transportation infrastructure. Interrelation between innovation, policies, and regulations to improve mobility services while reducing environmental impact.

Expanded Course Description

Transportation is the largest source of carbon emissions in the U.S. While much effort has been made to improve vehicle and fuel efficiency, the need for building context-sensitive infrastructure in concert with appropriate land use policies and behavior changes are equally important for achieving a sustainable transportation system. This course will explore both technological and non-technological strategies, policies, and regulations affecting infrastructure design, construction, operations, and maintenance; users' behaviors; and modal selections based on the Southern California transportation system.

Learning Objectives and Outcomes

Course materials will be readily available through real-world transportation principles and practices throughout Southern California.

At the end of this course, students will be able to:

- Identify past and current methods to construct and maintain transportation infrastructure.
- Compare various solutions in addressing the life cycle of different transportation assets.
- Interpret policy options that affect users' travel including alternative modes and micro mobility options.
- Examine other factors that impact future infrastructure development; and produce a comprehensive report using "problem-based learning approach", that recommends sustainable practices in constructing or maintaining an infrastructure.

Prerequisite(s): None

Co-Requisite(s): N/A

Concurrent Enrollment: N/A

Recommended Preparation: Transportation on the level of CE 471 or PPD 360.

Course Notes

Lectures are highly interactive and focused on “real-world” issues. Actual reports and case studies will form the basis for review and plan of actions. **Verbal communications and technical writing** will be emphasized throughout the course.

Technological Proficiency and Hardware/Software Required

The following software packages may be used in this course:

- Highway Capacity Software
- Synchro (<http://www.trafficware.com/synchro.htm>)
- Geographical Information System (GIS)
- Other as appropriate

Optional Readings and Supplementary Materials

- Traffic Engineering (5th Edition) Roger P. Roess, Elena S. Prassas, William R. McShane [ISBN 9780134599717]
- An Introduction to Sustainable Transportation: Policy, Planning and Implementation 1st Edition. Preston L. Schiller [ISBN 978-1844076659]
- Travel Matters: Mitigating Climate Change with Sustainable Surface Transportation. Transit (TCRP): TCRP Report, Transportation Research Board (https://www.trb.org/publications/tcrp/tcrp_rpt_93.pdf)
- Additional materials to be provided throughout the course

Description and Assessment of Assignments

This two-unit class will include lectures, field trips, guest speakers, written technical reports and independent research report.

- **Assignments:**
 - Three written reports in technical memorandum format are assigned.
 - Each assignment is due at the end of the specified week, that is, by Sunday 5pm Pacific Time.
- **Independent Comprehensive Design Project**
 - Each student will conduct in-depth research on a relatively focused topic related to transportation infrastructure, build environment, or specific mode(s) of transport throughout the course independently.
 - During Weeks 1–2, students will propose a Problem Statement and Abstract related to the given range of suitable topical areas.
 - By Week 3 after receiving approval of instructor on the proposed study topic and accepted abstract, each student will proceed with researching background information, categorizing probable causes to the problem(s), identifying suitable analytical framework and data source, proposing design elements or features to create/improve/renovate the identified problem(s) examining preliminary findings for intended versus unintended consequences, and producing a comprehensive written report on the student’s approach to completing this project.

- Deliverables will include two progress reports, each report is due at the end of the specified week, that is, by Sunday 5pm Pacific Time.
 - Additional details and instructions will be made available during the first three lectures.
 - Final report will be due on the last day of the semester.
- **Examples of Comprehensive Individual Design Projects:**
 - LNG, CNG, Bio-fuel, or Fuel-cell: Issues, challenges, opportunities to advance alternative fuels to power automobiles
 - Active transportation: environmental benefits, context, social justice and measure of success
 - Needs, opportunities, strategies, and life cycle cost of modernizing a truck stop along Interstate 10 (CA/NEVADA Boarder)
 - Sustainable options in constructing, re-constructing, and on-going maintenance of residential streets and sidewalks
 - Smart City: Near and long-term enhancements, needs, and strategies in a centralized traffic management system
 - Others
- **Mid-Term and Final Exams**
 - Both mid-term and final exams will be both quantitative and cumulative of the material covered in the course.

Grading Breakdowns

Assignments (10% for each assignment)	30%
Comprehensive Independent Design Project (10% for each Progress Report; 30% for the final report and contents)	50%
Mid-term Exam	10%
Final Exam	10%
TOTAL	100%

Assignment Rubrics: N/A

Assignment Submission Policy

All homework assignments are submitted via email in PDF format unless otherwise instructed. All submissions are due by the end of week on SUNDAY by 5pm Pacific Time.

Grading Timeline

The standard turn-around for receiving feedback/grade on each assignment/report is 7 days unless otherwise specified.

Course Schedule: A Weekly Breakdown

IMPORTANT:

In addition to in-class contact hours, all courses must also meet a minimum standard for out-of-class time, which accounts for time students spend on homework, readings, writing, and other academic activities. **For each unit of in-class contact time, the university expects two hours of out of class student work per week over a semester.**

	Topics/Daily Activities	Assignments & Due Dates
Week 1	Course overview. Basic concepts and physical components of transportation systems.	[Due by the end of Week #3] Assignment #1: Identify the bridge type, build methods, design-life vs actual life-span, and on-going maintenance methods and issues on one major bridge in California, for example, the Golden Gate Bridge, the Bay Bridge, or the Vincent Thomas Bridge (in the Port of Los Angeles).
Week 2	Inter-relations and inter-dependence between land use, policies, funding, and transportation.	
Week 3	Sustainable Community & Complete Street – Goals, Policies vs Implementation	
Week 4	Technical Field Trip #1: Different levels of Transportation Agencies	
Week 5	Transportation Infrastructure: Design and Procurement Process	[Due by the end of Week #5] Independent Project: Progress Report #1 (\cong 30%)
Week 6	Transportation Infrastructure: Construction	
Week 7	Technical Field Trip #2: Tour of a construction site	
Week 8	Transportation System Management and Integration	[Due by the end of Week #8]: Assignment #2: Based on the identified issues in Assignment #1, compare the life-cycle cost and options for replacement (partial or whole) at the end of it life cycle.
Week 9	Transportation System O&M	Mid-Term Exam
Week 10	Technical Field Trip #3: Tour of an operating agency (public works or transportation)	
Week 11	Mass Transit, Light Rail and Buses	[Due by the end of Week #10] Independent Project: Progress Report #2 (\cong 65%)
Week 12	Micro-mobility options. Strategies and policies to reduce vehicular trips and vehicle-miles-traveled; mode-shift; and social equity issues	

	Topics/Daily Activities	Assignments & Due Dates
Week 13	Technical Field Trip #4: Tour of AQMD or a resource agency	
Week 14	Land use policies, incentives, and public investment on EV charging, alternative fuels, and home building	[Due by the end of Week #14] Assignment #3 Recap of all field trips
Week 15	Individual Research Project: Presentation	Independent design project final report
FINAL	FINAL EXAM	

Additional Policies

Students shall not solely rely on Wikipedia for reference. When necessary, attempt to contact public agencies or private companies to inquire about relevant information for completing your individual project or group project. That is part of your “real-world” training. Students are expected to participate in course discussion enthusiastically; communicate with lecturer (in person, via email, Zoom, or voice call) openly; respond to assignments/inquires promptly; and collaborate/coordinate/cooperate with team members. These are fundamental skills in the workplace.

Policy on the use of Artificial Intelligence (AI) Generators in CE430 Sustainable Transportation

Using Generative AI in research and to facilitate technical write-ups is an unavoidable trend. Nevertheless, students must demonstrate full understanding of their own writing submissions.

I expect that you will use AI (e.g., ChatGPT and image generation tools) in this engineering class. Learning to use AI is an emerging skill, and I welcome the opportunity to meet with you to provide guidance with these tools during office hours or after class. Keep in mind the following:

- AI tools are permitted to help you brainstorm topics or revise work you have already written.
- If you provide minimum-effort prompts, you will get low-quality results. You will need to refine your prompts to get good outcomes. This will take work.
- Proceed with caution when using AI tools and do not assume the information provided is accurate or trustworthy. If it gives you a number or fact, assume it is incorrect unless you either know the correct answer or can verify its accuracy with another source. You will be responsible for any errors or omissions provided by the tool. It works best for topics you understand.
- AI is a tool, but one that you need to acknowledge using. Please include a paragraph at the end of any assignment that uses AI explaining how (and why) you used AI and indicate/specify the prompts you used to obtain the results what prompts you used to get the results. Failure to do so is a violation of academic integrity policies.

- Be thoughtful about when AI is useful. Consider its appropriateness for each assignment or circumstance. The use of AI tools requires attribution. You are expected to clearly attribute any material generated by the tool used.

Here are examples of using ChatGPT related to the course topics:

- “Prepare a 1,000 words write-up on the impact on transportation infrastructure due to global warming.”
- “Write a script on seaport automation and its impact on organized labor workforce.”
- “Recommend up to five strategies for a local city to deploy sustainable transportation operations.”

Please ask me if you are unsure about what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Collaboration. In this class, you are expected to submit work that demonstrates your individual mastery of the course concepts.

Group work. Unless specifically designated as a ‘group project,’ all assignments are expected to be completed individually.

Computer programs (if used). Plagiarism includes the submission of code written by, or otherwise obtained from someone else.

If found responsible for an academic violation, students may be assigned university outcomes, such as suspension or expulsion from the university, and grade penalties, such as an “F” grade on the assignment, exam, and/or in the course.

SCHOOLWIDE POLICIES, EXPECTATIONS AND RESOURCES

Lecturer’s Expectations: Please participate in course discussion enthusiastically; communicate with me (in person, via email or phone call or zoom) openly; respond to my assignments/inquiries promptly; and collaborate, coordinate, cooperate with your team members. These are fundamental skills in the workplace.

Etiquette - Expected Social Behavior

1. Be on time - We will begin each class promptly at 10am Pacific Time, unless otherwise instructed.
2. Present yourself in a professional manner. This course is part of a professional degree program and students are expected to act and present themselves professionally. Adhere to the same standard of behavior in the classroom and online (office-hour) as you would at work.
3. Speak in a professional manner: e.g., use neutral language, avoid labels and stereotypes or overgeneralizations about groups/populations.
4. Promote participation and foster respect among fellow students.
5. Establish norms/standards/roles when you enter a breakout room.

6. Every student is encouraged to participate actively in breakout discussion.
7. When joining in discussion, provide thoughtful, succinct, and non-argumentative contributions to the discussion.
8. No multitasking

STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEMS

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA

must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[*Counseling and Mental Health*](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[*988 Suicide and Crisis Lifeline*](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[*Relationship and Sexual Violence Prevention Services \(RSVP\)*](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[*Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)*](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[*Reporting Incidents of Bias or Harassment*](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[*The Office of Student Accessibility Services \(OSAS\)*](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[*USC Campus Support and Intervention*](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[*Diversity, Equity and Inclusion*](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.