



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

CE 471: Principles of Transportation Engineering and Economics

Units: 4

Fall 2024—M W—1600-1750

Location: DMC 261

Instructor: Dr. Ketan Savla

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Teaching Assistant: TBD

Course Description

This is a 4-unit undergraduate course covering the principles of design, operation, control and economics of transportation systems.

Efficient transportation systems are essential for the quality of life and economic progress of societies. By their very nature, transportation systems are socio-technological systems. They have undergone major transformations, perhaps none more significant than we are witnessing currently in the context of increasing autonomy, connectivity and societal impacts.

This course primarily aims to expose students to fundamental engineering and economic concepts which have remained at the core of transportation systems through all the transformations, with a particular focus on urban traffic. Topics covered include human factors, geometric design, traffic flow theory, capacity and performance analysis, queueing theory, travel demand forecasting, key economic concepts and their implications for transportation, as well as a discussion on impact of transportation on air quality, noise and energy consumption. Students interested in gaining basic analytical and quantitative understanding of transportation systems will find this course appealing.

Prerequisite(s): MATH 226 or MATH 227 or MATH 229

Course Notes

The class will have letter grade. The class will use the USC Brightspace website as the primary medium for distribution of course material, including assignments, and for announcements.

Required Readings and Supplementary Materials

C. S. Papacostas and P. D. Prevedouros, "Transportation Engineering and Planning", Third Edition, Prentice Hall, 2001.

The above textbook is available to purchase from the USC bookstore. Supplemental reading material will be provided as needed.

Description and Assessment of Assignments

The points per assignment and their % grade in the table below are only approximate.

Assignment	Points	% of Grade
1	60	5.00
2	55	5.00
3	60	5.00
4	70	5.00
5	70	5.00
6	55	5.00
TOTAL		30

Class Project:

The purpose of the class project is to encourage students to explore material related to but outside the material covered in lectures. The process is supposed to get students acquainted with tools for independent study.

Students are required to form groups of 2 each, and select a topic for their project. Each group is expected to make project proposal, interim report, final report and in-class presentation. In each group, students are

expected to collaborate to prepare the project proposal, interim report, final report and in-class presentation; however, individual contribution of every student will be tested in the Q \& A session following the in-class presentation.

Important dates:

Project proposal due: September 27 2024 (on Brightspace)

Interim report due: November 1 2024 (on Brightspace)

In-class project presentation: December 2 2024 (slides submission on Brightspace)

Final report due: December 6 2024 (on Brightspace)

Guidelines and specifications for the class project

Project topic: The project topic should be related to the material covered in the class. Each group is then expected to choose papers, book chapters or case studies related to their topic, do independent study and develop new results. A good starting point to search for topics and material for the project is the set of references at the end of chapters in the textbook. New results could be in the form of simulation studies, case studies on data sets, etc.

Project proposal: One page document, minimum of 10 pt, single spaced, single column, containing:

- project topic,
- names of group members,
- references to the material that the group plans to cover, and
- short description of the goals of the project.

Interim report: A maximum of 4 page document, minimum of 10 pt, single spaced, single column, containing:

- project topic,
- names of group members,
- review of literature,
- preliminary results.

Final report: A maximum of 8 page document, minimum of 10 pt, single spaced, single column, containing:

- project topic,
- names of group members,
- review of literature,
- final results and conclusion.

In-class presentation: A total of 15 min consisting of a 10-min presentation (maximum of 10 slides) shared between all the group members, followed by a 5 min Q\& A session with the instructor, where questions will be asked to every group member about any part of the project.

Grading Breakdown

Homework assignments	30 %
Midterm exam	20 %
Class project	
Proposal	5 %
Interim report	5 %
Class presentation	5 %
Final report	5 %
Final Exam	30 %

Class Attendance

Lectures will not be recorded on zoom. Attendance and participation in lectures are mandatory. Non-attendance can be the basis for lowering a student's course grade and any excused absence requires a doctor's note or official documentation.

Grading Scale

Students will be graded based on their total scores (possibly relative to the overall class performance) The following is merely a rough guideline, and is subject to revision depending on the overall class performance.

A	90-100
B	80-89
C	70-79
D	60-69
F	below 60

Assignment Submission Policy

Unless otherwise stated, homework assignments are due on Brightspace before the beginning of the class. Solutions will be posted on Brightspace shortly after the assignments are turned in.

Grading Timeline

The homeworks and midterms will be graded and handed back roughly one week after their due date.

Additional Policies

Late homework will not be accepted. No exceptions except institution-established emergency reasons; credit for such late homework is with the discretion of the instructor.

Reasonable collaboration in solving homework problems is allowed. This includes reviewing and discussing the problems with current CE 471 students, TA or the instructor. Everybody has to write his/her own solution independently and make sure to fully understand it. Exchanging solutions, consulting with people other than class members, finding solutions on the web or elsewhere, etc. are not allowed. Violations result in losing the credit for the entire homework set in addition to a significant percentage of the overall course grade, all with the discretion of the instructor.

All answers should be clearly and fully justified. If the steps are not clear, points will be deducted even if the final answer is correct.

Attendance will be taken in every lecture. The students are expected to be attentive, and in particular refrain from using computers or hand held devices, except for the sole purpose of the class. Non-compliance will result in point deduction from class participation part of the grading, and possibly a percentage of the overall course grade, all with the discretion of the instructor.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Homework	Deliverable/ Due Dates
Week 1	Introduction, Equations of Motion, Human Factors	Ch. 1, Ch. 2: sections 2.1, 2.2, 2.3, 2.4.4	Homework 1 assigned
Week 2	Geometric Design, Traffic Flow Theory	Ch. 2: sections 2.4.5, 2.4.7, 2.4.9, Ch. 3: sections 3.1, 3.2, 3.3.1, 3.3.2	
Week 3	Traffic Flow Theory and Regression	Ch. 3: sections 3.3.3, 3.3.4, 3.4, 3.5, 3.6, Ch. 13: sections 13.3 and 13.4	Homework 2 assigned; Homework 1 due
Week 4	Capacity Analysis	Ch. 4: sections 4.3.1, 4.3.2, 4.3.3, 4.4, 4.5.1, 4.5.2, 4.5.3, 4.5.4, 4.6.1, 4.6.2, 4.6.3	
Week 5	Capacity and Level of Service Analysis, Basics of Probability	Ch. 4: sections 4.6.4, 4.6.5, 4.6.6, 4.7.1, 4.7.2, Ch. 13: section 13.2	Homework 3 assigned; Homework 2 due; Project proposals due
Week 6	Queueing and Simulation	Ch. 14 + supplementary material to be provided	Homework 3 due
Week 7	Intelligent Transportation Systems, Economy of Scale, Trip Generation	Ch. 5, Ch. 6, Ch 8: sections 8.1, 8.2	
Week 8	Mid term week (October 9 2023)		Homework 4 assigned
Week 9	Trip Distribution, Mode Choice	Ch. 8: sections 8.3, 8.4	
Week 10	Elements of Consumer theory	Supplementary material to be provided	Homework 5 assigned; Homework 4 due; Project interim report due
Week 11	Demand, Supply	Supplementary material to be provided	
Week 12	User vs. Social Equilibrium	Ch. 8: sections 8.5.6 thru 8.5.10 + class notes	Homework 6 assigned; Homework 5 due
Week 13	Traffic Assignment	Ch. 8: sections 8.5.6 thru 8.5.10 + class notes	
Week 14	Air Quality, Noise, and Energy Impacts + Course Review	Ch. 10: sections 10.1, 10.2	Homework 6 due
Week 15	Class Project Presentations		Project final report due
FINAL			Please check classes.usc.edu for final exam scheduling.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. In the case of suspicion of academic dishonesty, students are referred to the Office of Student Judicial Affairs and Community Standards (SJACS) for further review. Information about the SJACS review process can be found at: <https://sjacs.usc.edu/students/academic-integrity/>. The SJACS website provides additional resources that you may find helpful, so see their website: <https://sjacs.usc.edu/students/>

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call
<https://studenthealth.usc.edu/sexual-assault/>

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu

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

Bias Assessment Response and Support - (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support

Office of Student Accessibility Services (OSAS) - (213) 740-0776
<https://osas.usc.edu/>

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710
<https://campussupport.usc.edu/students/>

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

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu

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) 442-120 – 24/7 on call
dps.usc.edu

Non-emergency assistance or information.