Electronic Course Authorization System (ECAS)

CEGE 3201 - VIEW COURSE PROPOSAL

Back to Proposal List

Approvals Received:	**Department** on 12/1/21 by Tiffany Ralston (tralston@umn.edu)
Approvals Pending:	**College/Dean** > Provost > LE
Effective Status:	Active
Effective Term:	**New:** 1223 - Spring 2022 **Old:** 1199 - Fall 2019
Course:	CEGE 3201
Institution:	UMNTC - Twin Cities/Rochester
Campus:	UMNTC - Twin Cities
Career:	UGRD
College:	TIOT -
Department:	11101 -

General

Course Title Short:	Transportation Engineering
Course Title Long:	Transportation Engineering
Max-Min Credits for Course:	3.0 to 3.0 credit(s)
Catalog Description:	Applying laws of motion to vehicle performance, determining constraints for highway designs. Traffic flow principles, their relation to capacity and level of service. Geometric design, traffic control, pavement design, transportation planning. prereq: PHYS 1301, (CEGE 3101, CEGE 3102 can be taken concurrently)
Print in Catalog?:	Yes
CCE Catalog Description:	false
Grading Basis:	AFV
Topics Course:	No
Honors Course:	No
Online Course:	No
Freshman Seminar:	No
Is any portion of this course taught outside of the United States?:	No
Community Engaged Learning (CEL):	None
Instructor Contact Hours:	3.0 hours per week
Course Typically Offered:	Every Fall & Spring

Component 1:	LEC
Component 2:	DIS
Component 3:	**New:** <No text provided> **Old:** <No text provided>
Auto Enroll Course:	Yes
Graded Component:	DIS
Academic Progress Units:	3.0 credit(s) (Not allowed to bypass limits.)
Financial Aid Progress Units:	3.0 credit(s) (Not allowed to bypass limits.)
Repetition of Course:	Repetition not allowed.
Course Prerequisites for Catalog:	<No Text Provided>
Course Equivalency:	<No text provided>
Cross-listings:	No cross-listings
Add Consent Requirement:	No required consent
Drop Consent Requirement:	No required consent
Enforced Prerequisites: (course-based or non-course-based):	No prerequisites
Editor Comments:	<No text provided>
Proposal Changes:	<No text provided>
History Information:	<No text provided>
Faculty Sponsor Name:	**New:** Michael Levin **Old:** <No text provided>
Faculty Sponsor E-mail Address:	**New:** mlevin@umn.edu **Old:** <No text provided>

Student Learning Outcomes

Student Learning Outcomes

* Students in this course:

- Can identify, define, and solve problems

How will you assess the students' learning related to this outcome? Give brief examples of how class work related to the outcome will be evaluated.

(a) an ability to apply knowledge of mathematics, science, and engineering (j) a knowledge of contemporary issues

Please explain briefly how this outcome will be addressed in the course. Give brief examples of class work related to the outcome.

homework and exams

Liberal Education

Requirement this course fulfills:	**New:** TS Technology and Society **Old:** <No text provided>
Other requirement this course fulfills:	**New:** <no text provided> **Old:** <No text provided>
Criteria for Core Courses:	**Describe how the course meets the specific bullet points for the proposed core requirement. Give concrete and detailed examples for the course syllabus, detailed outline, laboratory material, student projects, or other instructional materials or method.**

Core courses must meet the following requirements:

- **They explicitly help students understand what liberal education is, how the content and the substance of this course enhance a liberal education, and what this means for them as students and as citizens.**
- **They employ teaching and learning strategies that engage students with doing the work of the field, not just reading about it.**
- **They include small group experiences (such as discussion sections or labs) and use writing as appropriate to the discipline to help students learn and reflect on their learning.**
- **They do not (except in rare and clearly justified cases) have prerequisites beyond the University's entrance requirements.**
- **They are offered on a regular schedule.**
- **They are taught by regular faculty or under exceptional circumstances by instructors on continuing appointments. Departments proposing instructors other than regular faculty must provide documentation of how such instructors will be trained and supervised to ensure consistency and continuity in courses.**

Criteria for Theme Courses:

Describe how the course meets the specific bullet points for the proposed theme requirement. Give concrete and detailed examples for the course syllabus, detailed outline, laboratory material, student projects, or other instructional materials or methods.

Theme courses have the common goal of cultivating in students a number of habits of mind:

- **thinking ethically about important challenges facing our society and world;**
- **reflecting on the shared sense of responsibility required to build and maintain community;**
- **connecting knowledge and practice;**
- **fostering a stronger sense of our roles as historical agents.**

New: Most students have some preconceived notions of transportation systems based on years of navi-
gating them. Many have identied issues with transportation: tra♬c congestion; ine♬cient public transit, etc. Part of developing a liberal education is approaching existing aspects of society with a scientic mind. CEGE 3201 provides a rigorous perspective on transportation systems founded on engineering design principles and scientic study of traveler behaviors. For example, tra♬c conges-
tion is studied in terms of route choices leading to a high concentration of vehicles on certain roads,
as well as tra♬c
ow theory for modeling the behavior of tra♬c congestion and drivers in such
tra♬c. These topics are treated with engineering rigor and mathematical modeling. By studying
such engineering, students gain a deeper understanding of transportation systems, and are more prepared to understand their issues and nd informed solutions. This helps students understand
part of a liberal education | a scientic study of a critical system to society that most people in-
teract with but have little understanding of. After completing CEGE 3201, students are prepared for informed discussions about issues with our transportation systems and potential solutions. The
content and substance of this course enhance a liberal education by providing that rigorous study of transportation systems. As citizens, students will be able to make informed decisions about using, navigating, and improving transportation systems, and participate appropriately in venues such as
voting on electric vehicle tax incentives, infrastructure funding, etc.
CEGE 3201 addresses two SLOs:
? Problem solving
? Critical thinking
CEGE 3201 is taught every fall and spring semester.
CEGE 3201 is only taught by tenured or tenure-track faculty in the Civil, Environmental, and Geo-
Engineering department.
CEGE 3201 is 3 credits, and includes 2hrs of lecture and a 1hr lab of transportation data analysis
per week.
Criteria for all theme courses
I will discuss how CEGE 3201 meets each requirement of theme courses, addressing each require-
ment separately.
? thinking ethically about important challenges facing our society and world;

? re
ecting on the shared sense of responsibility required to build and maintain community;
? connecting knowledge and practice;
? fostering a stronger sense of our roles as historical agents.
3.1 Thinking ethically about important challenges facing our society and world
E♬cient transportation is itself an important challenge for society. We rely on transportation
systems to commute to work each day, and transportation delivers food to grocery stores for us
to purchase. There are many ethical questions around the design of transportation systems. For
4
example, should we try to minimize the total congestion (which might result in more congestion for
certain areas) or focus on providing equal access to di♂erent minorities? Should we design public
transit to serve demand or emphasize it to reduce private vehicle tra♬c and the corresponding tra♬c
congestion and greenhouse gas emissions? Tradeo♂s like this are inherent in engineering problems which a♂ect all people. The homework problem in Appendix A.5 asks students to consider the tradeo♂ between ridesharing and public transit in the public transit design. Students must consider
how changing the frequency of the light rail train reduces the capacity to match demand, but also
a♂ects people's behavior and decreases ridership. They must therefore confront the choice between
designing a system that encourages public transit use versus designing a system for maximum
e♬ciency.
3.2 Re
ecting on the shared sense of responsibility required to build and main-
tain community
In one sense, transportation systems are designed by the engineers, companies, and government agencies responsible for designing them. However, traveler behaviors collectively demand a trans-
portation system that works for them. Much of transportation engineering is creaeting aggregate models describing the behavior of travelers. In that sense, travelers have a shared responsibility
to build the transportation system that they desire. If a signicant proportion of travelers shift
towards public transit, engineers will design the public transit system accordingly and will have the corresponding fare revenue to use in the design. One example of a CEGE 3201 class activity which

asks students to re
ect on this shared sense of responsibiility is relating user equilibrium route
choice to the prisoner's dilemma from game theory. Slides for this exercise are shown in Appendix A.8. The prisoner's dilemma is a scenario in which individuals are incentivized to behave in their
own best interests; there is an individual advantage gained by trying to minimize their individual
penalties. However, because every individual behaves similarly, the collective penalties are larger.
A similar situation happens with drivers in how individual drivers seek to minimize their own travel
time, but in doing so cause traffic congestion to be worse for everyone. This shows a shared re-
sponsibility among the participants in transportation systems; by reducing selsh motivations, the
overall system can be improved.

3.3 Connecting knowledge and practice

Transportation engineering in practice requires the assistance of computer tools to study the trans-
portation systems of large cities. CEGE 3201 explains some theory of how transportation models
are developed, but also aims to connect that knowledge with how such models are used in prac-
tice. For example, after developing the concept of user equilibrium, students are given an Excel homework problem to nd user equilibrium using a numerical method similar to those used in
practice. This helps students understand how the knowledge is applied in practice and what to
look for when using computer tools to solve this problem. The homework problem is presented in
Appendix A.6. Students are given a simple network with realistic parameters that could be used
for real cities. This problem is not easy to solve through equations; instead, students must use
the method of successive averages, which is an algorithm used to solve user equilibrium problems
on much larger networks. This helps students connect the theory of what user equilibrium is to
the practical aspects of how to nd it and the challenges of nding an exact solution. In fact, an
exact solution requires innite iterations to attain, but the solution will get progressively better
with each iteration of the method of successive averages. Students will learn how to determine the
accuracy of their solution.

3.4 Fostering a stronger sense of our roles as historical agents

Design choices around transportation infrastructure and systems have major impacts on society. For instance, highways have sometimes been built through neighborhoods of certain races or economic backgrounds rather than others. Public transit access is better for certain areas of Minnesota than others. Many of these decisions continue to a♂ect us today. Hard infrastructure like roads and highways cannot easily be moved, and transportation connectivity has a♂ected the development of di♂erent areas of the city. Understanding how transportation systems are designed will help students understand the options that transportation engineers had, and how they decided among those options. For example, refer to the problem on designing the TSA PreXsecurity lines in Appendix A.2. The numbers are designed so that the only two solutions to the problem are to have either 1 or 2 TSA PreXlines. With 0 TSA PreXlines, the capacity is insu♬cient for the demand. With only 1 TSA PreXline, the TSA PreXand regular lines have roughly equal waiting times. This would seem to be fair. However, in such a scenario, passengers would no longer pay for TSA PreX, which would eventually revert to the 0 TSA PreXline scenario in which the capacity is insu♬cient. Therefore, students can understand that the seemingly unfair security lane allocation is motivated by other specics of the problem structure. This is an example of how previous engineering decisions may seem obviously wrong now, but can be better understood through a rigorous engineering analysis.

Criteria for the Technology and Society theme

Although nowadays we take transportation for granted, 100 years ago the lack of automobiles af- fected city life and urban layouts. Transportation is therefore a technology that has had a profound impact on society, and emerging developments in vehicle automation are likely to revolutionize how we interact with transportation systems. Becoming informed about transportation system design is a necessary step for students to become thoughtful consumers of transportation technologies.

CEGE 3201 considers the impact of technology on society by creating models of traveler be- haviors. These models require connecting a conceptual understanding of people's choices, such as where they choose to live and work, with transportation options. For example, consider the homework problem in Appendix A.7. Students must predict how changes in travel times due to technological changes in transportation would a♂ect people's choices. The problem proposes some changes in travel times due to vehicle automation, which could a♂ect where people choose to live and work. Students must adapt engineering methods to calculate the new travel choices.

CEGE 3201 also discusses how society's responses to transportation shapes its use, and develops mathematical models of that behavior. For instance, consider the slides in Appendix A.8, where selsh user behaviors negatively affect the outcome of the system. When driving, most of us try to choose routes that will minimize our travel time. However, such routes will create more congestion, causing all drivers to experience higher travel times. This is an example of how the responses of society shape the use of transportation technology and the design of transportation systems. Students are asked to understand such behaviors conceptually and create models of them to predict their impacts.

Another related problem is presented in Appendix A.5, showing how users respond to trans- portation systems; the frequency of light rail trains a♂ects the capacity as well as ridership, which is a traveler choice. As engineers try to adjust the frequency of trains for e♬ciency by matching the passenger capacity to the demand, their adjustment itself a♂ects demand because lower frequencies cause higher waiting times for travelers. Consequently, CEGE 3201 students are introduced to many perspectives on the use of technology. These include the perspective of the engineers who plan and design transportation systems; these engineers are mostly concerned with the e♬cient operation of transportation systems. Students also study and model the perspective of individual users in choosing which aspects of the transportation system to use, such as which roads to drive on or which modes (driving or public transit) to use in their commute.

A.2 Airport queue modeling and checkpoint design

After checking in at the airport, passengers walk to and join the security checkpoint line. Passengers arrive at the rate of 2.82 per minute. 30% of these passengers have purchased TSA PreX(expedited security check).

TSA has 12 X-ray scanners total. Each scanner provides either TSA PreXor standard service.

Passengers who have purchased TSA PreXwill choose TSA PreXlines unless none are available.

Passengers who have not purchased TSA PreXmust use the standard lines. Standard screening require 5 minutes on average. TSA PreXscreening requires only 1 minute
on average. If no lines are designated as TSA PreX, all passengers (including those with TSA PreX) must endure standard 5min screening.
(a) Decide how many of the 12 scanners are allocated to standard screening and to TSA PreXscreening. Justify your choice. Does your choice minimize queue length, waiting time, or some other ob-
jective?
(b) TSA PreXcosts $85 per 5 years. Those 30% of passengers with TSA PreXwill not renew their
TSA PreXsubscription unless it saves them signicant time. Does that a♂ect the choice you
made in part (a)?
Solutions The queueing model is M=M=n because passenger arrivals are random (di♂erent walk-
ing speeds from the check-in counter, among other things); passenger departures are random (dif-
ferent numbers of bags to send through the scanner); and there are multiple scanners.
The equations for M=M=n queueing are given in Section 5.5.5 of Mannering. I entered them
in Excel to compare the allocation of scanners between standard screening and TSA PreX. Notice
that if all 12 scanners are on standard screening, all passengers (including TSA PreXpassengers) must endure standard screening. You can reduce the number of calculations by observing that when at least 1 TSA PreXscanner
is active, → for the non-TSA PreXqueue is

→ =
⊥

⊤
=
2:82 ┐ 30%
0:2
= 9:87

which requires either 10{12 scanners open. When 0 TSA PreXscanners are active, → for the non-
TSA PreXqueue is

→ =
⊥

⊤
=
2:82
0:2
= 14:1

which cannot be served with 12 scanners. (When 0 TSA PreXscanners are active, ⊥ = 2:82 because
all passengers use the same standard line.) So there are only two possibilities, 11 standard and 1 TSAPreX, or 10 standard and 2 TSA PreCheck.

Modifying traﬃc signals for automated vehicles
What changes would you make to the following timings for autonomous vehicles? Explain your reasoning for every change you make, and everything you do not change.
(a) The duration of the clearance (all-red) interval.
(b) The duration of the change (yellow) interval.
(c) Startup lost time at the start of each phase.
Solutions
? The clearance interval is based on kinematics | the time to clear the intersection | and therefore would not change.
? For the change interval, the reaction time might be much less for autonomous vehicles. The stopping distance component would be the same.
? Alternatively, you could completely remove change intervals if the light duration is commu-
nicated to autonomous vehicles wirelessly instead of through traﬃc lights.
? The startup lost time could be reduced either through smaller computer reaction times, or by communicating the start of the green light to vehicles in advance.

Old:

LE Recertification-Reflection Statement (for LE courses being re-certified only): <No text provided>

Statement of Certification:

This course is certified for a Core (blank) as of
This course is certified for a Theme (blank) as of

Writing Intensive

Propose this course as Writing Intensive curriculum: No

Question 1 (see CWB Requirement 1):

What types of writing (e.g., reading essay, formal lab reports, journaling) are likely to be assigned? Include the page total for each writing assignment. Indicate which assignment(s) students will be required to revise and resubmit after feedback by the instructor or the graduate TA.

<No text provided>

Question 2 (see CWB Requirement 2):

What types of writing (e.g., research papers, problem sets, presentations, technical documents, lab reports, essays, journaling etc.) will be assigned? Explain how these assignments meet the requirement that writing be a significant part of the course work, including details about multi-authored assignments, if any. Include the required length for each writing assignment and demonstrate how the 2,500 minimum word count (or its equivalent) for finished writing will be met.

<No text provided>

Question 3 (see CWB Requirement 3):

How will students' final course grade depend on their writing performance? What percentage of the course grade will depend on the quality and level of the student's writing compared to the percentage of the grade that depends on

the course content? Note that this information must also be on the syllabus.

<No text provided>

Question 4 (see CWB Requirement 4):

Write up a sample assignment handout here for a paper that students will revise and resubmit after receiving feedback on the initial draft.

<No text provided>

Question 5 (see CWB Requirement 5):

What types of instruction will students receive on the writing aspect of the assignments?

<No text provided>

Question 6 (see CWB Requirement 6):

How will the assistants be trained and supervised?

<No text provided>

Statement of Certification: This course is certified for a Theme (blank) as of

Course Syllabus

Course Syllabus:

New: CEGE 3201: Introduction to Transportation Engineering
Spring 2022
Technology and Society theme
1 Instructors
Dr. Michael Levin
Email: mlevin@umn.edu
Course meeting time: T/Th 1:00 PM{1:50 PM, 212 Civil Engineering Building
Lab: (a) Th 2:30 PM { 3:20 PM, 221 Civil Engineering Building
(b) Th 4:00 PM { 4:50 PM, 221 Civil Engineering Building
Oce: 140 Civil Engineering Building
Oce hours: M 10{12pm, W 4{5pm, F 3{4pm or by appointment
Course website: https://canvas.umn.edu/courses/193546
Teaching assistant: Te Xu
Email: xutetelove01@gmail.com
Oce: 275 Civil Engineering Building
Oce hours: W 11:15 AM { 12:15 PM or by appointment
2 Course description
This course is an introduction to solving transportation problems through analysis and design of transportation models. Topics include travel demand modeling, mode choice, network analysis principles, and transit operations; trac
ow principles, level of service, and signal
control; and roadway geometric design. After completing this course, you will have a fundamental understanding of transportation system problems and concepts, as well as experience and tools to work with transportation data. This course also emphasizes using prerequisite mathematics, physics, and computer skills for engineering problem-solving.
Technology and society theme Although we take transportation technologies for granted now, when automobile transportation rst became widespread it revolutionized how people live and work. Transportation is experiencing a similar upheaval now with the emergence of automated vehicle technologies. This course covers how transportation systems are used and aected by travelers. We will analyze data and construct engineering models that describe how transportation systems behave from multiple perspectives, including the perspectives of individual travelers and the perspective of transportation planning agencies.
1
Liberal education course Most of us have developed some preconceived notions of transportation systems based on years of using them. Many of us have identied issues with transportation: trac congestion; inecient public transit, etc. Part of developing a liberal education is approaching existing aspects of society with a scientic mind. CEGE 3201 provides a rigorous perspective on transportation systems founded on engineering design principles and scientic study of traveler behaviors. For example, trac congestion is studied in terms of route choices leading to a high concentration of vehicles on certain roads, as well as trac
ow theory for modeling the behavior of trac congestion and drivers in
such trac. These topics are treated with engineering rigor and mathematical modeling. By studying such engineering, students gain a deeper understanding of transportation systems, and are more prepared to understand their issues and nd informed solutions.
3 Course format
Unlike other engineering courses you may have taken, this course will primarily follow a problem-based learning format. I will introduce transportation problems to you during the lecture session. These problems will be solvable using the prerequisite skills (calculus,

probability & statistics, kinematics, and programming), and much of the class time will be spent solving these problems. I will also be assigning you realistic transportation problems to solve. In the lecture, I will give you simplied versions so that you can develop concepts, but you will solve more realistic versions for assignments. The purpose is for you to learn problem-solving skills, not just solution methods. My goal is for you to develop the concepts of the solution during class, be introduced to relevant computer tools in the lab session, then solve realistic transportation problems as homework. Every student is expected to participate in class discussions of problems and solutions. Active engagement with problems in-class has been shown to increase learning and retention1.
3.1 Co-requisites
The co-requisites for this course are CEGE 3101, CEGE 3102, and Phys 1301. As the semester progresses, we will use geometry, calculus, probability and statistics, and kinematics. Some of the homeworks and lab assignments will require spreadsheet work or programming in Matlabs. This class will not make use of extensive technical knowledge from any of the prerequisite courses. For instance, you will encounter basic calculus-based kinematic motion equations, but not momentum or energy problems. Rather, the challenge is in learning which techniques apply to which problems. Success in CEGE 3201 relies on understanding the underlying core concepts and not just the calculations involved. If it has been a while since you took these courses, you may nd it worthwhile to review the prerequisites before the semester gets too busy.
1Deslauriers, L., McCarty, L., Miller, K., Callaghan, K., & Kestin, G. (2019). Measuring actual learning
versus feeling of learning in response to being actively engaged in the classroom. Proceedings of the National
Academy of Sciences.
2
These co-requisites may be waived or satised by equivalent classes from other departments.
3.2 Course materials
The textbook for this course is Principles of highway engineering and tra♬c analysis, 7th edition, by Fred Mannering, Walter Kilareski, and Scott Washburn. Readings will be assigned at the end of each lecture to supplement material covered in class. The textbook also contains lookup tables for certain calculations, which we will reference in-class and on assignments. The cheapest new version I have seen is on the Wiley website. Older editions are probably usable, but you should nd other ways to obtain the most recent versions of lookup tables and behavioral parameters for engineering problems.
Unfortunately, no recent textbook on transportation engineering covers all of the class material. Slides will be posted on the course website before each class. Slides contain links to solutions to in-class problems. At the end of each set of slides are reading assignments and suggested practice problems. For supplementary reading that covers certain topics in greater depth, I also recommend https://en.wikibooks.org/wiki/Fundamentals_of_ Transportation, available online for free.
4 Assessment
Grades will be determined entirely by performance on homework and lab assignments.
Category Weight
Homework assignments 30%
Lab assignments 30%
Midterm exam 15%
Final exam 25%
The +=? grading system will be used. At the end of the course, I may apply a curve if needed to ensure a proper grade distribution. Please feel free to contact me at any time during the semester to discuss your progress to date.
Assignments will be posted on Canvas and announced in class. Schedule changes will be announced on Canvas. Late submissions will be penalized by 30% (maximum score 70%), and will only be accepted up to one week late so that I can post solutions online. Do not look at solutions from past semesters. I consider this academic dishonesty. Some assignments will use similar solution methods as past problems, and reviewing past solutions will deny you the opportunity to discover the solution yourself.
Although attendance is not a component of the nal grade, succeeding in this course requires full understanding of the concepts, and few students can achieve this without regular class attendance and participation. The class format (problem-based learning) is designed to encourage you to study and master the concepts during class.
3
4.1 Homework assignments
Homeworks will be assigned weekly and include both conceptual and engineering problem-solving questions. Homeworks will be challenging, and they will require signicant time and e♂ort. Do not wait until the night before to start! Understanding the engineering equations will not be su♬cient to succeed on the homeworks; you must master the concepts to answer correctly. Homeworks will usually be assigned weekly and include conceptual or computational problems. You are encouraged to work together on homeworks, but you must write your solutions individually, in your own words. You may use spreadsheets or other computer software on the homeworks. Email your spreadsheets and programs to me as part of the homework submission.
4.2 Lab assignments
You will be assigned additional computer-based problems as lab assignments. These problems will focus on realistic datasets that are unwieldy to work with by hand. Therefore,

we will be using Excel and Matlab to solve transportation problems with these datasets (hence the need for CEGE 3101 as a prerequisite). The TA session willintroduce the data and computer skills needed to complete these assignments, such as software used in practice (Synchro) or large datasets (trip surveys).
4.3 Exams
The midterm exam will be given around halfway through the semester during class time. The nal exam is cumulative, and will be held at the University-scheduled time. Due to the COVID-19 restrictions, exams will be given online. Please have a scientic or graphing calculator available. You may use any notes or textbooks you have on the exam. However, you may not receive or give help to anyone else (including current and former students).
If you have a schedule con
ict with an exam, please inform me as far in advance as
possible so that alternative arrangements can be made. Depending on the circumstances, these arrangements may include taking a di♂erent exam before or after the scheduled time, additional assignments, and/or adjusting a student's nal grade distribution. Except for unforeseen and documented emergencies, makeup exams will not be given without prior notice.
4.4 ABET student outcomes
This class addresses the following ABET student outcomes:
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
4
5. An ability to function e♂ectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
4.5 Student learning outcomes
CEGE 3201 addresses two student learning outcomes. Both outcomes will be assessed through homeworks, lab assignments, and exams.
? Problem solving. Students will learn how to solve engineering problems; engineering methods will be discussed in class, but novel problems will be introduced in homework assignments that require students to adapt their knowledge of engineering methods to new types of problems.
? Critical thinking. Transportation systems are adapting to the emergence of automated vehicle technology. Students will study how existing engineering methods might be modied to more accurately model automated vehicles. Homeworks will include con-
ceptual problems asking students to modify methods from class.
5 Miscellania
The University of Minnesota provides, upon request, appropriate academic adjustments for qualied students with disabilities. For more information, contact the Disability Resource Center at https://diversity.umn.edu/disability/. Mental health and stress manage-
ment services are also available from UMN.
Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including failing the course and/or dismissal from the University. Since dishonesty harms the individual as well as other students, policies on scholastic dishonesty will be strictly enforced. At a minimum, students will receive a `0' for any plagiarized assignment.
Students may withdraw from a class within the rst 2 weeks of class without penalty.
Between 2 weeks and 10 weeks, students may `W' drop a course without seeking approval.
After 10 weeks, withdrawing requires an academic policy petition.
Please also refer to the following policy statements:
? Makeup Work for Legitimate Absences: Twin Cities, Crookston, Morris, Rochester
? Teaching and Learning: Student Responsibilities (Twin Cities, Crookston, Morris, Rochester)
? Sexual Harassment, Sexual Assault, Stalking and Relationship Violence
? Equity, Diversity, Equal Employment Opportunity, and A♬rmative Action
? Academic Freedom and Responsibility
5
6 Schedule
A tentative class schedule is shown below, but dates and topics may change.
Tuesday Thursday
1/18 1 1/20 2
Orientation Trip generation
1/25 3 1/27 4
Mode choice Shortest path
2/1 5 2/3 6
Trip distribution Tra♬c assignment
2/8 7 2/10 8
Tra♬c assignment Tra♬c assignment
2/15 9 2/17 10
Tra♬c assignment Public transit
2/22 11 2/24 12
Public transit Driver behavior
3/1 13 3/3 14
Tra♬c

ow theory Midterm exam
3/8 3/10
Spring break Spring break
3/15 15 3/17 16
Traﬃc
ow theory Traﬃc
ow theory
3/22 17 3/24 18
Queuing theory Queueing theory
3/29 19 3/31 20
Capacity / Level of service Traﬃc signals
4/5 21 4/7 22
Traﬃc signals Traﬃc signals
4/12 23 4/14 24
Traﬃc signals Vertical geometric design
4/19 25 4/21 26
Vertical geometric design Vertical geometric design
4/26 27 4/28 28
Lateral geometric design Lateral geometric design
Old: 1. Course Title:
CEGE 3201: Introduction to Transportation Engineering
2. Credit and Contact Hours
3 credit hours
2 contact hours per week (lecture) 1 contact hour per week (recitation)
3. Instructors:
Dr. Gary Davis Dr. Alireza Khani
4. Textbook:
Principles of Highway Engineering and Traffic Analysis, F. Mannering and S.Washburn, 5th Edition, 2012.
a. Other supplemental materials
None
5. Specific Course Information:
a. Brief description of the content of the course (catalog description)
Applying laws of motion to vehicle performance, determining constraints for highway designs. Traffic flow principles, their relation to capacity and level of service. Geometric design, traffic control, pavement design, transportation planning.
b. Prerequisites or co-requisites
PHYS 1301 or equivalent
CEGE 3101, CEGE 3102 (co-requisites)
c. Required, elective, or selected elective
Required: CE
Selected elective: EnvE, GeoE
6. Specific Goals for the Course
a. Specific outcomes of instruction
? Basic understanding of the fundamental issues in transportation.
? Basic understanding of the factors influencing road vehicle performance.
12
? Knowledge of basic principles of highway geometric design and ability to apply these principles to solve simple problems.
? Basic understanding of traffic flow and queuing theory.
? Knowledge of basic procedures for highway capacity and level of service analysis.
? Basic understanding of traffic signal theory and elements of traffic signal operation.
? Basic understanding of travel demand and traffic forecasting.
b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
(a) an ability to apply knowledge of mathematics, science, and engineering
(j) a knowledge of contemporary issues
7. Brief list of topics to be covered
Vehicle Performance/Human Factors
Geometric Design
Traffic Flow
Traffic Signals
Freeway Capacity and Level of Service (LOS)
Pavement Design
TravelDemand/Forecasting

Strategic Objectives & Consultation

Name of Department Chair Approver:

New: Joseph Labuz
Old: <No text provided>

Strategic Objectives - Curricular Objectives:

How does adding this course improve the overall curricular objectives of the unit?

New: Already a current course

Old: <No text provided>

Strategic Objectives - Core Curriculum:

Does the unit consider this course to be part of its core curriculum?

New: yes
Old: <No text provided>

Strategic Objectives - Consultation with Other Units:

Before submitting a new course proposal in ECAS, circulate the proposed syllabus to department chairs in relevant units and copy affiliated associate dean(s). Consultation prevents course overlap and informs other departments of new course offerings. If you determine that consultation with units in external college(s) is unnecessary, include a description of the steps taken to reach that conclusion (e.g., catalog key word search, conversation with collegiate curriculum committee, knowledge of current curriculum in related units, etc.). Include documentation of all consultation here, to be referenced during CCC review. If email correspondence is too long to fit in the space provided, paraphrase it here and send the full transcript to the CCC staff person. Please also send a Word or PDF version of the proposed syllabus to the CCC staff person.

New: Already a current approved course
Old: <No text provided>

Back to Proposal List