

**Western University - Faculty of Engineering
Department of Civil and Environmental
Engineering**

CEE 4401A – Principles of Transportation Engineering - Course Outline 2023

This course introduces fundamental principles in the area of transportation engineering. The primary course objectives are to:

- Provide students with a basic understanding of the principles of transportation engineering and planning;
- Illustrate the principles of transportation engineering, using practical applications and case studies;
- Learn the transportation systems characteristics;
- Recognize key geometric elements of highways from a designer's perspective and identify the influence of human factors on geometric design;
- Learn the traffic stream characteristics and how traffic flows through a highway network (Traffic flow theory)
- Learn the process of urban transportation planning, travel demand forecasting, and how to undertake and complete a Transportation Impact Assessment Study (TIA).

Calendar Copy:

Principles of transportation engineering and planning, including: vehicle motion and human factors, geometric design, design consistency, traffic modeling, capacity and level of service, transportation planning, transportation management, simulation and transportation impact studies. Practical applications and case studies are emphasized.

Prerequisites: CEE 2219A/B

Antirequisites:

Note: It is the student's responsibility to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the student's responsibility to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

Contact Hours:

3 lecture hours/week (required);

2 tutorial hours/week. Although tutorials are not mandatory, quizzes are taken during tutorial hours, and the course software is only installed in the tutorial room. In addition, students seeking assistance with weekly assignments or clarification on lecture material are strongly encouraged to attend;

Additional self-study: As needed;

Classes begin: September 11, 2023;

Fall Reading Week: October 30 – November 5, 2023;

Classes end: December 8, 2023;
Exam period: December 10 – 22, 2023.

Contingency plan for an in-person class pivoting to 100% online learning:

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

Instructor:

Maged Elmadhoon, M.Eng., P.Eng.
Email: melmadh3@uwo.ca

Textbook:

Papacostas, C.S. and Prevedouros, P.D. Transportation Engineering & Planning. Third Edition, Prentice Hall, Upper Saddle River, N.J. 2001.

Other References:

- Transportation Association of Canada. Geometric design guide for Canadian roads. TAC, Ottawa, Ontario (revised 2017).
- Highway Capacity Manual 2010, Transportation Research Board.
- Trip Generation Manual, Institute of Transportation Engineers
- Ontario Traffic Council (OTC) <http://www.otc.org>. Ontario Traffic Manual's Book 7 (Temporary Conditions)
- Intelligent Transportation Systems (ITS) Canada <https://www.itscanada.ca>

Units:

Both SI and FPS unit systems may be used in lectures, tutorials and examinations.

Specific Learning Objectives:

The lectures and tutorial assignments will prepare students to do the following [GA Indicator]:

1. Develop knowledge base in highway geometric design and safety, traffic engineering and transport planning application areas **[KB 3, PA 2]**
2. Develop depth of knowledge in highway alignments, transport planning and simulations, and traffic impact study using a four-step transport planning model **[KB 3, PA 2, ITW2]**
3. Develop critical thinking and problem-solving skills **[PA 3]**
4. Use specific traffic software (Synchro 10) to solve transportation engineering, planning and operations applications **[ET 2]**

General Learning Objectives:

E=Evaluate, T= Teach, I= Introduce

Problem Analysis	T	Team Work	E	Ethics and Equity	-
Investigation	E	Communication	T	Economics and Project	-
Design	T	Professionalism	-	Life-long Learning	-
Engineering Tools	I	Impact on Society	-		-

Evaluation:

The final mark will be determined as follows:

Assignments (5)	25%
Quizzes (5)	10%
Project (1)	25%
Written Final exam	40%
Total	100%

Note: Students must pass the final examination to pass this course. Students who fail the final examination will be assigned the aggregate mark, as determined above, or 48%, whichever is less. Students who have failed this course previously must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.

Examination, Assignments, Quizzes and Project:

- 1. Final exam:** A three-hour, closed book written final examination will be held during the regular examination period. The exam covers the whole course materials. Questions may be mixed with multiple choices and problem solving. Only hand-held non- programmable calculators are permitted in the final examination. Students should consult the list of approved calculators posted outside the Civil and Environmental Engineering Department Office.
- 2. Quizzes:** Five 30 minutes quizzes, closed-book, based on class-lectures, comprised of multiple choices and/or problem solving. These quizzes will be scheduled during tutorial hours. Only hand-held non- programmable calculators are permitted in the quizzes.
- 3. Assignments:** Five assignments to be submitted electronically only through OWL (typed-no hand-written/scanned assignments will be accepted unless instructed) on due date/time before the set deadline. Late assignment submission without proper justification will be discounted at a compound rate of 20% per day for 3 days only. Weekend counts one day.
- 4. Project:** The Transportation Impact Assessment (TIA) project combines some aspects of traffic analyses, transport planning, and geometric design applications combined in a report. The lab/tutorial contents are designed to develop the individual components of this TIA Project.

Course Content and Tentative Schedule:

Week	Subject	Assignments/ Quizzes	Textbook Chapter(s) / Optional
1	General information, course objective, course outline Introduction to Transportation Systems Transportation Systems Characteristics Road Classification Functions of transportation systems Introduction to Complete Streets	Assignment #1	1, 5, Lecture Notes
2	Highway Geometric Design – Part 1 Vehicle motion Human factors Sight distance	In-Tutorial quiz #1	2, Lecture Notes
3	Highway Geometric Design – Part 2 Horizontal Alignment Super-elevation Vertical Alignment	Assignment #2	2, Lecture Notes
4	Traffic Engineering Studies & Traffic Stream Flow Models Vehicle Stream Models Stream Equations and Diagrams Measurements Shockwave Theory Traffic Calming	In-Tutorial quiz #2	3, Lecture Notes
5	Highway Capacity and Level of Service Capacity and LOS of Multilane Highways Capacity of signalized & unsignalized intersections Introduction to Highway Capacity Software (HCS) Introduction to (TIA) Studies	Assignment #3 Prepare for the Project (TIA)	4, 9, 11, Lecture Notes
6	Transportation Planning Urban Transportation Planning Travel Demand Forecasting/The four-Step Model Trip Generation & Trip Distribution Case Study: London 2030 TMP	In-Tutorial quiz #3	7, 8 Lecture Notes
Fall Reading Week – Oct 30–Nov 5, 2023			
7	Transportation Planning Modal Split Trip Assignment Intersection Design / Types of Intersections At-Grade Intersections Grade-Separated Intersections	Assignment #4	7, 8, Lecture Notes
8	Traffic Control Devices Intersection Controls Types of Intersection Control Devices	In-Tutorial quiz #4	Lecture Notes

	Traffic Signals		
9	Queuing Analysis & Models Access Management	Assignment #5	14, Lecture Notes
10	Transportation Demand Management Pedestrians Facilities Bicycle Facilities Public Transit System Case Study: London's BRT System	In-Tutorial quiz #5	Lecture Notes
11	Parking Studies Introduction to Airport Access & Parking Introduction to Road Safety Intelligent Transportation Systems (ITS) ITS Traveler Information Connected and Autonomous Vehicles Case Study: Downtown London Parking Strategy Case Study: London Road Safety Strategy		Lecture Notes
12	Review of all class contents		

Use of English:

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Cheating:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

For more information on scholastic offenses, please see:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Attendance:

Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Accommodation and Accessibility:**Religious Accommodation**

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf

Conduct:

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Please turn off your cell phone before coming to a class, tutorial, quiz or exam. On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: <http://www.uwo.ca/univsec/board/code.pdf>

Sickness and Other Problems:

Instructors are encouraged to arrange participation requirements and multiple small assignments in such a way as to allow students some flexibility (e.g., by grading based on the best n-2 of n quizzes or assignments) to reduce the number of requests for academic considerations and consequent burden on both instructors and academic counsellors. Where academic considerations are required, the student should be given clear direction.

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade:

For work worth less than 10% of the total course grade, the instructor is empowered to grant academic considerations without referring the student to their academic counsellors. If an instructor chooses to do so, the mechanism for dealing with missed work (e.g., an extension, make-up opportunity, or reweighting) must be specified on the course outline to ensure fair treatment for all students. Note that in all cases where documentation (medical or otherwise) is required, it can only be collected by the student's Dean's Office Academic Counselling unit.

Assessments worth 10% or more of the overall course grade:

By policy, academic considerations for work totaling 10% or more of the final course grade can be granted only by the student's Faculty of Registration (typically by their academic counsellors). In such cases, students should be directed as follows.

For work totaling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

The Student Medical Certificate is available at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Clearly define how the absence will be handled (e.g., an extension, make-up opportunity, or reweighting).

When defining the rules for excused absences, you should ensure that the essential requirements of the course are still met. For example, if the final examination is not cumulative, it would normally be advisable to offer a make-up for the midterm test rather than a reweighting to the final.

Absences from Final Examinations

If you miss the Final Exam, please contact Western Engineering Undergraduate Services as soon as possible. They will assess your eligibility to write the Special Examination.

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

Note: missed work can only be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is not sufficient on its own.

Academic Policies:

The website for Registrarial Services is <http://www.registrar.uwo.ca>

In accordance with policy,
https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual’s official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Only hand-held non- programmable calculators are permitted in the final examination and quizzes.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Support Services:

Please visit the Western Engineering Undergraduate Services webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.eng.uwo.ca/undergraduate/index.html>

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html

To connect with a case manager or set up an appointment, please contact support@uwo.ca

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at:

http://academicsupport.uwo.ca/accessible_education/index.html if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience

website to manage your academics and well-being: <https://www.uwo.ca/se/digital>

Additional student-run support services are offered by the USC, <https://westernusc.ca/services>

Notice:

Students are responsible for regularly checking their email, course website (<https://owl.uwo.ca>) and notices posted outside the Civil and Environmental Engineering Department Office.

Consultation:

Students are encouraged to discuss problems with their teaching assistant and/or the Instructor in tutorial sessions. Office hours will be arranged for the students to see the Instructor and teaching assistants. Other individual consultation can be arranged by appointment with the instructor.

Course Breakdown (AUs):

Engineering Science 75%; Engineering Design 25%

The attached document "INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED" is part of this course outline.

STATEMENT ON GENDER-BASED AND SEXUAL VIOLENCE

Western [is committed to reducing incidents of gender-based and sexual violence](#) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, [here](#). To connect with a case manager or set up an appointment, please contact support@uwo.ca.

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

If, on medical or compassionate grounds, you are unable to write term tests or final examinations or complete course work by the due date, you should follow the instructions listed below. You should understand that academic relief will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services Office) that there are compelling medical or compassionate grounds that can be documented before academic relief will be considered. Different regulations apply to term tests, final examinations and late assignments. Please read the instructions carefully.

A. GENERAL REGULATIONS & PROCEDURES

1. All first-year students will report to the Undergraduate Services Office by submitting the [Academic Consideration Request Form](#), for all instances.
2. If you are an upper year student and you are missing a test/assignment/lab or examination you will report the absence by submitting [Academic Consideration Request Form](#). Absences worth LESS THAN 10% of your mark, will be processed by your department office. If your course work is worth 10% OR MORE of your final grade, your request will be processed by the Undergraduate Services Office.
3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.
4. Documentation must be provided as soon as possible. If no one is available in your department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.
5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. TERM/MIDTERM TESTS

1. If you are in first year and you are unable to write a midterm/term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.
2. If you are an upper year student and you are unable to write a midterm/term test, inform your instructor PRIOR to the scheduled date of the test and request relief through the [Academic Consideration Request Form](#). If the instructor is not available, leave a message for him/her at the department office. If the test is worth LESS THAN 10% of your mark, your request for relief will be processed by your department office. If the test is worth MORE THAN 10% of your final grade your request for relief will be processed by the Undergraduate Services Office.
3. Be prepared to attach supporting documentation to the Department Chair and/or the Undergraduate Services Office through the online form (see next page for information on documentation).
4. Discuss with the instructor if and when the test can be rescheduled. The approval of the Chair or the Undergraduate Services Office is required when rescheduling midterm/term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to report your absence using the [Academic Consideration Request Form](#) and request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must submit an "[Application for a Special Exam](#)" form. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

D. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to submit the [Academic Consideration Request Form](#) and provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the

Associate Dean, Undergraduate Studies. Documentation is mandatory.

- ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean, Undergraduate Studies.

E. SHORT ABSENCES

If you miss a class due to a minor illness or other problem, check your course outlines for information regarding attendance requirements and make sure you are not missing a test, laboratory or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You are strongly encouraged to seek advice from your Academic Counsellor in the Undergraduate Services Office.

G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician

to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. **ACADEMIC CONCERNS**

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).
2. You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.
3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your Academic Counsellor.

Calendar References: Check these regulations in your 2023 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness:

https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_135

Academic Accommodations for Students with Disabilities:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_10

Academic Accommodations for Religious or Holy Days:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_16

Course Withdrawals:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=6&SelectedCalendar=Live&ArchiveID=#Page_75

Examinations:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=5&command=showCategory&SelectedCalendar=Live&ArchiveID=#Page_75

Scheduling of Term Assignments:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=5&SelectedCalendar=Live&ArchiveID=#SubHeading_78

Scholastic Offences:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_20

Student Medical Certificate:

<https://www.eng.uwo.ca/files/undergraduate/student-medical-certificate.pdf>

Engineering Academic Regulations:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=4&SelectedCalendar=Live&ArchiveID=#Page_86

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Add Deadlines:

First term half course (i.e. "A" or "F")	September 15, 2023
Full courses and full-year half course (i.e. "E", "Y" or no suffix)	September 15, 2023
Second term half course (i.e. "B" or "G")	January 16,

2024

Drop Deadlines:

First term half course without penalty (i.e. "A" or "F")	November 13,
--	--------------

2023

Full courses and full-year half courses without penalty (i.e. "E", "Y" or no suffix)	November 30, 2023
Second term half or second term full course without penalty (i.e. "B" or "G")	March 7, 2024

Contact Information:

Undergraduate Services Office:
Chemical & Green Process Engineering:
Civil Engineering:
Computer, Electrical, Mechatronic Systems & Software Engineering
Integrated Engineering
Mechanical Engineering:

SEB 2097 Phone: 519-661-2130
TEB 477 Phone: 519-661-2131
SEB 3005 Phone: 519-661-2139
TEB 279 Phone: 519-661-3758
ACEB 2410 Phone: 519-661-6725
SEB 3002 Phone: 519-661-4122

E-mail: engugrad@uwo.ca
E-mail: cbeugrad@uwo.ca
E-mail: civil@uwo.ca
E-mail: eceugrad@uwo.ca
E-mail: engceli@uwo.ca
E-mail: mmeundergraduate@uwo.ca