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

CEE 4401A – Principles of Transportation Engineering - Course Outline 2025

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 4, 2025;
Classes end: December 9, 2025

Instructor:
Dr. Yili (Kelly) Tang, P.Eng. Email: ytang564@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:

Introductory (I), Developing (D), or Advanced (A) level

Knowledge Base	I	Use of Engineering Tools	I	Impact on Society and the Environment	
Problem Analysis	D	Individual and Team Work	D	Ethics and Equity	
Investigation		Communication Skills		Economics and Project Management	
Design		Professionalism		Life-Long Learning	

Accreditation Units:

Engineering Science 75%; Engineering Design 25%

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 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 2 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
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 Traffic Signals	In-Tutorial quiz #4	Lecture Notes
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 as needed**		
* No lecture in reading week			

FACULTY OF ENGINEERING POLICIES:
Students must familiarize themselves with the policies of the Faculty of Engineering
https://www.eng.uwo.ca/electrical//pdf/2025-UG-Policy-and-Procedures.pdf

Missed/Late Accommodation Policy:

1. Students missing a test/assignment/lab or examination you will report the absence by submitting Academic Consideration Request form through STUDENT ABSENCE PORTAL.
2. Documentation must be provided as soon as possible.

Exam Accommodation:

1. If you are unable to write a final examination, report your absence using the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
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 the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
   PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

Late Assignments:

- Students must advise the course instructor if they are having difficulty completing an assignment on time (prior to the due date of the assignment).
- Students should be prepared to submit the Academic Consideration Request Form and requested to provide documentation at: https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html

- If granted an extension, a revised due date should be established with the course instructor. 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.
- This course has 5 quizzes with only 4/5 quizzes counted towards your final grade. Academic consideration will not be granted for missed quizzes. If students miss 1/5 quizzes, the remaining 4 quizzes will be used in the calculation of the final grade. If students miss greater than 1 quiz, they will receive a grade of zero on each missed quiz.
- 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.

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

Medical Accommodation:

1. Requests for Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
2. Requests for academic consideration must include the following components:
    a. Self-attestation signed by the student (*This is only accepted for the first/one absence*)
    b. Medical note
    c. Indication of the course(s) and assessment(s) affected by the request
    d. Supporting documentation as relevant
3. Requests without supporting documentation are limited to one per term per course.
4. **Students must request academic consideration as soon as possible and no later than 48 hours after the missed assessment.**
5. Once the request and supporting documents have been received and reviewed, appropriate academic consideration, if granted, shall be determined by the instructor in consultation with the academic advisor, in a manner consistent with the course outline.

    Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements. Some forms of academic consideration, such as arranging Special Examinations, assigning a grade of Incomplete, or granting late withdrawals without academic penalty, may only be granted by the Academic Advising office of the Faculty of Engineering.

Religious Accommodation:

When scheduling unavoidably conflicts with religious holidays, which (a) require an absence from the University or (b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate Department Chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning the work done in classes from which they are absent and to take appropriate action.

Academic Integrity:

In the Faculty of Engineering, we encourage students to create a culture of honesty, trust,

fairness, respect, responsibility, and courage, befitting the professional degree you are pursuing.

Please visit Academic Integrity Western Engineering for more information

Academic Offences:
Plagiarism means using another's work without giving credit. The university has rules against plagiarism and other scholastic offences. Western Engineering has a zero-tolerance policy on plagiarism. The minimum penalty is zero on the course work and a repeat offence will earn you zero on the course. A third offence may lead to expulsion from the university.
Scholastic Discipline for Undergraduate Students & Cheating, Plagiarism and Unauthorized Collaboration: What Students Need to Know

Students must write their reports, essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (http://www.turnitin.com). Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Faculty of Engineering AI Policy:
The use of generative Artificial intelligence (GenAI) tools won't be discouraged in the Faculty of Engineering. As we pride ourselves on building the future we can't hide from the use of GenAI tools to contribute to the understanding of the course materials. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed, as a resource.
GenAI tools use won't be permitted in any type of examination or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

Use of English Policy:
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 except for 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.

Accessibility:
Western is committed to achieving barrier free accessibility for persons with disabilities studying, visiting and working at Western. As part of this commitment, there are a variety of services, groups and committees on campus devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. To help provide the best experience to all members of the campus community, please visit the Accessibility Western University for

information on accessibility-related resources available at Western.

Students with disabilities may arrange for academic accommodation at Western. For a more detailed explanation, please visit Academic Support & Engagement -Academic Accommodation.

Inclusivity, Diversity, and Respect:

The Faculty of Engineering at Western University is committed to creating equitable and inclusive learning environments that value diverse perspectives and experiences. We recognize that university courses often marginalize students based on social identity characteristics such as, but not limited to, Indigeneity, race, ethnicity, nationality, ability, gender identity, gender expression, sexuality, age, language, religion, and socioeconomic status. Understanding this, we strive to facilitate equitable experiences and inclusion within the classroom by respecting and integrating multiple ways of knowing, being, and doing. Please visit the Office of Equity, Diversity and Inclusion.

Health and Well-Being:

- Health & Wellness Services – Students - Offers appointment-based medical clinic for all registered part-time and full-time students.
- Mental Health Support - Provides professional and confidential services, free of charge, to students needing assistance to meet their personal, social and academic goals. Services include consultation, referral, groups and workshops, as well as brief, change-oriented psychotherapy.
- Crisis Support - For immediate assistant, please visit Thames Hall Room 2170 or call 519-661-3030. The crisis clinic operates between 11:00 am - 4:30 pm. For after-hours crisis support, click here.
- Gender-Based Violence and Survivor Support - 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.

Important Contacts:

Engineering Undergraduate Services	SEB 2097	519-661-2130	engugrad@uwo.ca
Civil & Environmental Engineering	SEB 3005	519-661-2139	civil@uwo.ca
Office of the Registrar/Student Central	WSSB 1120	519-661-2100	

Important Links:

- WESTERN ACADEMIC CALENDAR
- ACADEMIC RIGHTS AND RESPONSIBILITIES