Civil Engineering
CIVENG 4T04
Transit Modelling and Intelligent Transportation Systems
Winter 2026

McMaster University
ENGINEERING

Instructor Information



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Office Hours:
Thursday 13:00-14:00

TA Information

Name: Yasser Kashwaa
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Name: Zoe Meth
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Office Hour: By appointment (BSB 342)

Class Times

Lectures: Mondays, Wednesdays, Thursdays 16:30PM - 17:20PM at BSB 119

Tutorials: Mondays 12:30PM - 2:30PM at CNH 106

Class Format

The topics in this course will be presented in a traditional lecture format. Students are expected to attend and actively participate in the lectures. Tutorials will be used to review and practice key concepts presented in the lectures. Students are encouraged to actively participate in class discussions.

In-person attendance is required for this course!

Course Dates: 01/05/2026 - 04/07/2026
Units: 4.00
Course Delivery Mode: In Person
Course Description: Introduction to advanced traffic signal modelling, basic Transit Engineering concepts and Intelligent Transportation Systems. Three lectures, one tutorial (two hours); one term Prerequisite(s): CIVENG 3K03

Instructor-Specific Course Information

This course builds on the materials offered in 3K03 “Introduction to Transportation Engineering” and covers transportation modelling, basic transit engineering concepts, and Intelligent Transportation Systems (ITS). The course is developed in three overarching themes. Theme one focuses on transportation modelling at the Micro, Meso, and Macro levels as well as the associated software applications. Theme two introduces transit modelling and operation and reviews the modelling approaches for timetables, frequency, and vehicle assignment. Theme three offers a detailed review of the data collection, design, and operation of ITS. These three themes will be incorporated into bi-weekly problem sets and a team project that will focus on:

- Dynamic operational modelling (Meso/Microsimulation)
- Transit engineering operations and planning
- Intelligent Transportation Systems (ITS) strategies and mathematical models

The term project group will consist of a complete design project focusing on a public transit system: LRT or HSR. This group project will serve as the backdrop to essentially tie-in all of the concepts learned within the course.

During the course, students will have the opportunity to learn two fundamental simulation tools: QGIS, Vissim Traffic Simulation, and GTFS processing via Python. These tools will equip students with advanced knowledge that is highly valued in the transportation industry.

Important Links

- Mosaic
- Avenue to Learn
- Student Accessibility Services - Accommodations
- McMaster University Library
- eReserves

Course Learning Outcomes

- Identify all four stages of the Urban Transportation Modelling System (UTMS) for the purposes of traffic demand forecasting in the event of new developments [CEAB Indicator 1.4]

- Perform the necessary calculations for each stage of the UTMS to estimate the trips generated at a specific site, the expected modal split, trip distribution and trip assignment [CEAB Indicator 1.3]

- Assess the level of service of transit service on selected areas via calculation and micro simulation [CEAB Indicators 1.4 and 7.1]

- Apply the fundamental principles of transit theory and the associated and transit engineering knowledge to solve unfamiliar problems pertaining to new developments or implementation of different transit strategies in transportation design [CEAB Indicator 3.2]

Graduate Attributes

The Canadian Engineering Accreditation Board (CEAB) is a division of Engineers Canada and is responsible for accrediting undergraduate engineering programs across Canada. Accreditation by the CEAB ensures that the engineering programs meet a national standard of quality and cover essential educational requirements. Graduate Attributes are a set of qualities and skills that the CEAB expects engineering graduates to possess. These attributes are a benchmark for the learning outcomes of accredited engineering programs. This section lists the Graduate Attribute Indicators associated with the Learning Outcomes in this course.

Through this course, you will develop the following graduate attributes and indicators:

1. A knowledge base for engineering (Demonstrated competence in university-level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.)
2. 3 Competence in Engineering Fundamentals
3. 4 Competence in Specialized Engineering knowledge
4. Problem analysis (An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.)
5. 1 Demonstrates an ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed.
6. 3 Obtains substantiated conclusions as a result of a problem solution, including recognizing the limitations of the solutions.
7. Investigation (An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.)
8. 2 Selects appropriate model and methods and identifies assumptions and constraints.
9. Communication Skills (An ability to communicate complex engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.)

10. 1 Demonstrates an ability to respond to technical and non-technical instructions and questions.

Course Schedule

A weekly breakdown of the course schedule

Week	Lectures	Tutorials
1	Intro to Transportation Systems	NA
2	Travel Demand Modelling I	Trip generation model
3	Travel Demand Modelling II	Traffic assignment
4	Introduction to Transit (Data & Units)	Intro to QGIS & Census data
5	Transit Planning & Design I	Transit Modelling with QGIS
Midterm Break		
6	Transit Planning & Design II	Intro to GTFS
7	Transit Planning & Design III	Term Project
8	Transit Planning & Design IV	PTV Vissim/Vissum
9	Transit Capacity & Signal Priority	PTV Vissim/Vissum
10	ITS Introduction	Project Progress
11	ITS Optimization & Information flow	Project Progress
12	Special Topics	Project Presentation
13	Conclusion	Revisions

Required Materials and Texts

Please sign in with your MacID here to view your booklist

No Mandatory textbook is required for this course

Optional Course Materials

Please sign in with your MacID here to view your booklist

Public Transit Planning and Operation Modeling, Practice and Behavior
ISBN: 9781466563926
Authors: Avishai Ceder
Publisher: CRC Press
Publication Date: March 9, 2016
Edition: 2nd

Course Evaluation

Evaluation rubric will be shared for each assignment in the course.

The course grade includes a mix of individual (25%) and group assignments (40%) in addition to a final exam (35%).

Undergraduate Grading Scale

The McMaster 12 Point Grading Scale

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59

Grade	Equivalent Grade Point	Equivalent Percentages
D	2	53-56
D-	1	50-52
F	0	0-49

Graduate Grading Scale

Graduate Student Grading Scale (Except for MBA and Master of Finance)

Grade	Points	Equivalent Percentage	Pass/Fail
A+	12	90-100	P+
A	11	85-89	P
A-	10	80-84	
B+	9	77-79	
B	8	73-76	
B-	7	70-72	
F	0	69 and under	F

MBA and Master of Finance Grading Scale

Grade	Points	Equivalent Percentage	Pass/Fail
A+	12	90-100	P+
A	11	85-89	P
A-	10	80-84	
B+	9	75-79	
B	8	70-74	
B-	7	60-69	
F	0	59 and under	F

Late Assignments

Late submissions, that are not subject to accommodation, will not be considered.

Absences, Missed Work, Illness

- McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the

Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”. The McMaster Student Absence Form is a self-reporting tool for Undergraduate Students to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period. You may submit a maximum of 1 Academic Work Missed requests per term. It is your responsibility to follow up with your Instructor immediately regarding the nature of the accommodation. If you are absent more than 5 days or exceed 1 request per term you mustvisit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation. This form should be filled out immediately when you are about to return to class after your absence.

- Under normal circumstances, students submitting an MSAF will be granted an extension to the missed academic work, starting from the original listed deadline.

Generative AI: Some Use Permitted

Students may use generative AI for [editing/translating/outlining/brainstorming/revising/etc] their work throughout the course so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside the stated use of [editing/translating/outlining/brainstorming/revising/etc] without citation will constitute academic dishonesty. It is the student’s responsibility to be clear on the limitations for use and to be clear on the expectations for citation and reference and to do so appropriately.

Turnitin.com

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

APPROVED ADVISORY STATEMENTS

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy.

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

Authenticity / Plagiarism

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online

learning platform (e.g. Avenue to Learn, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

Courses with an On-line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn, LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and

working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online.**

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Requests for Relief for Missed Academic Term Work

In the event of an absence for medical or other reasons, students should review and follow the Policy on Requests for Relief for Missed Academic Term Work.

Academic Accommodation for Religious, Indigenous, or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, Indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's

Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.