Civil Engineering
CIVENG 4TA4
Traffic Analysis: Theory and Simulation
Winter 2026

McMaster University
ENGINEERING

Instructor Information

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Office Hours:
Wednesday 11:30 a.m. - 12:30 p.m.

TA Information

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Class Times

Lectures: Monday 10:30 a.m. - 12:20 p.m. and Wednesday 10:30 a.m. - 11:20 a.m.
Tutorials: Tuesday 4:30 p.m. - 6:20 p.m.
Labs: Monday 8:30 a.m. - 10:20 a.m.

Class Format

In Person

Course Dates: 01/05/2026 - 04/07/2026
Units: 4.00
Course Delivery Mode: In Person
Course Description: Traffic operation and transportation network analysis, including traffic studies, traffic flow models, shockwave analysis, advanced analysis of signalized intersections, capacity and level of service analysis, and road network simulation. Three lectures, one tutorial (two hours), one lab (two hours); one term Prerequisite(s): CIVENG 3K03

Instructor-Specific Course Information

- All course material (e.g., lecture notes, assignments, tutorial problems) will be posted on the course page on Avenue to Learn. It is the student's responsibility to check the course page on Avenue regularly for updates.
- All formal communications regarding this course will be conducted through McMaster email and/or Avenue to Learn. Please make sure that you check your McMaster email account and the course page on Avenue to Learn regularly.
- Students' emails to the instructor or the TAs should include the course number and a relevant description in the subject line of the email (e.g., CIVENG4TA4: Assignment 3 question). Emails that do not follow this format may not receive a response. The instructor and the TAs will respond to emails within three weekdays.
- If you believe that you have received incorrect grades (for any assignment or test), you must contact the instructor within one week of the day that the assignment/test was returned to you.
- Any additional policies/rules discussed in the first lecture and documented in the first lecture notes are considered complementary to the abovementioned course-specific policies.

Important Links

- Mosaic
- Avenue to Learn
- Student Accessibility Services - Accommodations

- McMaster University Library
- eReserves

Course Learning Outcomes

- Apply traffic flow models to analyze and manage traffic on highways.
- Learn the fundamentals of traffic shockwaves and their applications.
- Learn the different types of traffic sensors along with the data collected by each sensor.
- Learn the fundamentals of macroscopic and microscopic traffic flow models.
- Conduct key transportation studies (mainly, spot speed studies).
- Design various types of traffic signals (pre-timed, actuated, and coordinated signals).
- Analyze traffic signal operation using the Highway Capacity Manual's model.
- Apply the theoretical concepts covered in the course to assess and enhance the performance of transportation networks using real-world data through the term project.
- Master two traffic software packages (SYNCHRO and VISSIM).

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.

GA 2 (Problem analysis)

- Indicator 2.2: Proposes problem solutions supported by substantiated reasoning, recognizing the limitations of the solutions (Learning outcomes 3,4).

GA 3 (Investigation)

- Indicator 3.1: Selects appropriately from relevant knowledge base to plan appropriate data collection methods and analysis strategies (Learning outcome 5,7).
- Indicator 3.2: Synthesizes the results of an investigation to reach valid conclusions (Learning outcomes 5,7).

GA 4 (Design)

- Indicator 4.1: Defines the problem by identifying relevant context, constraints, and prior approaches before exploring potential design solutions (Learning outcome 1).
- Indicator 4.2: Explores a breadth of potential solutions, considering their benefits and trade-offs as they relate to the project requirements (Learning outcome 1).
- GA 4 (Design) - Indicator 4.4: Justifies and reflects on design decisions, giving consideration to limitations, assumptions, constraints and other relevant factors (Learning outcome 2).

GA 5 (Tools)

- Indicator 5.2: Successfully uses engineering tools (Learning outcomes 6 & 9).

GA 6 (Teamwork)

- Indicator 6.1: Actively contributes to the planning and execution of a team project (Learning outcome 8).

GA 7 (Communication)

- Indicator 7.2: Composes an effective written document for the intended audience (Learning outcome 8).
- Indicator 7.3: Composes and delivers an effective oral presentation for the intended audience (Learning outcome 8).

Lab Safety

The Faculty of Engineering is committed to McMaster University's Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs". It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Health and Safety. The Lab Safety Handbook is available here, as well as on A2L.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment. A laboratory-specific set of rules can also be added to ensure that students fully understand laboratory safety rules that are in place prior to their first session.

Course Schedule

The table below displays a tentative schedule of the course

Week	**Topic**
Week 1	Introduction and definitions
Week 2	Traffic signal design (Pre-timed signals)
Week 3	Traffic signal design (Pre-timed signals)
Week 4	Signal coordination and Actuated signal design

Week	Topic
Week 5	Signalized intersection analysis (Capacity and Level of Service)
Week 6	Fundamentals of uninterrupted flow
Week 7	Midterm recess (no classes)
Week 8	Macroscopic traffic flow models
Week 9	Shockwave analysis and applications
Week 10	Shockwave analysis and applications
Week 11	Microscopic traffic flow models
Week 12	Traffic data collection
Week 13	Spot speed studies
Final Exam	Scheduled during the regular University Final Examination period established by the Registrar's Office

Required Materials and Texts

Please sign in with your MacID here to view your booklist

There are no mandatory textbooks for this course.

Course Evaluation

Method of evaluation	Weight
Assignments (4 assignments)	20% (5% each)
Midterm	25%
course project	25%
Final exam	30%

To pass this course, you **must**:

- Score a passing grade in the course (50%).
- Write both the midterm and the final exams.

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
D	2	53-56
D-	1	50-52
F	0	0-49

Late Assignments

Late assignments will not be accepted.

Absences, Missed Work, Illness

If you submit an MSAF, you are granted the following reliefs, based on the missed work:

- Assignments: If you submit an MSAF for a missed assignment, you are granted a 72-hour extension of the deadline.
- Project submission: If you submit an MSAF for a missed project submission, you are granted a 72-hour extension of the deadline.
- Midterm: If you submit an MSAF for the midterm, you will be given a chance to write the exam on another date.

Generative AI: Use Prohibited

Students are not permitted to use generative AI in this course. In alignment with McMaster academic integrity policy, it "shall be an offence knowingly to … submit academic work for assessment that was purchased or acquired from another source". This includes work created by generative AI tools. Also state in the policy is the following, "Contract Cheating is the act of "outsourcing of student work to third parties" (Lancaster & Clarke, 2016, p. 639) with or without payment." Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

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.