COURSE OUTLINE

COURSE INFORMATION

Course Name: Transit Modelling and Intelligent Transportation Systems
Course Code: CIVENG 4T04
Session Offered: Winter 2024

Calendar Description:
As a continuation of 3K03 – Introduction to Transportation Engineering, this course introduces advanced traffic signal modelling, basic Transit Engineering concepts and Intelligent Transportation Systems.

Instructor(s): Gamal Eldeeb Phone:
Email: eldeebg@mcmaster.ca Office Hours: Thursdays (5:30-7:30)
Class Schedule Day(s):
Tuesdays Time: 08:30 - 09:20
Thursdays Time: 08:30 - 09:20
Fridays Time: 08:30 - 09:20
Tutorial Schedule Day(s):
Fridays Time: 12:30-02:20

Please check (https://covid19.mcmaster.ca/information-for-students-2/) for more information on McMaster's guidelines to Return-to-Mac.

1. COURSE OBJECTIVES

This course builds on the materials offered in 3K03 "Introduction to Transportation Engineering" and covers transportation modelling, basic transit planning concepts, and Intelligent Transportation Systems (ITS). The course is developed in three overarching themes. Theme one introduces transit modelling and operation and reviews the modelling approaches for ridership estimation. Theme two focuses on transportation modelling at the Micro, Meso, and Macro levels as well as the associated software applications. Theme three offers an overview of the Intelligent Transportation Systems (ITS) ITS. These three themes will be incorporated into bi-weekly problem sets and a team project.

The term project group will consist of a complete design project focusing on a public transit system analysis. 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 three fundamental transportation planning tools: QGIS, Synchro Traffic Simulation and Remix Transit Simulation (industrial-based transit software). These tools will equip students with advanced knowledge that is highly valued in the transportation industry.

2. COURSE SPECIFIC POLICIES

2.1. Canadian Engineering Accreditation Board Graduate Attributes and Indicators

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.)
1.3 Competence in Engineering Fundamentals
1.4 Competence in Specialized Engineering knowledge
2. 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.)

2.1 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.
2.3 Obtains substantiated conclusions as a result of a problem solution, including recognizing the limitations of the solutions.
3. 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.)
3.2 Selects appropriate model and methods and identifies assumptions and constraints.
7. 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.)
7.1 Demonstrates an ability to respond to technical and non-technical instructions and questions.

2.2. Course Materials

Lecture Notes
Lecture notes, assignments, and exercises will be made available through Avenue to Learn.
Supplementary Optional Reading
Meyers, M.D., and Miller, E.J. (2001) **Urban Transportation Planning**, Second Edition, McGraw Hill, New York.
Ceder, A. (2016) **Public transit planning and operation: Modeling, practice and behaviour**. CRC press.
Teply, S., Allingham, D.I., Richardson, D.B., Stephenson B.W., (2008) **Canadian Capacity Guide for Signalized Intersections**, third edition, Ite
Available at: http://www.tac-atc.ca/sites/tac-atc.ca/files/site/doc/resources/report-capacityguide.pdf

2.3. Communication, Discussion, and Feedback

All formal communications regarding this course will be through **McMaster's email account** and/or **Avenue to Learn**. Please be sure to check your McMaster account regularly. If you have not received emails regarding **4T04**, it is your responsibility to contact the course coordinator with your McMaster email address and ensure your name is on the distribution list. Similar information will be posted on Avenue to Learn.

Email subject line **must start with the course number** (otherwise, your email will be filtered out) followed by a colon and includes a relevant description of the content in the email (e.g. ***4T04: Assignment 1 question***).

Following this policy, students may expect a response from the TAs within two business days or from the instructor in four business days. Emails that do not follow this policy may not receive a response.

You are encouraged to discuss the feedback that you receive on your assignments with the course TAs and the course instructor. If you believe that you have received incorrect grades, you must contact the teaching team immediately with an **email explanation**. This process should be no later than one week from the day that the assignment was returned.

2.4. Professional Class Conduct

Attending lectures and tutorials is mandatory. A student with at least 75% of attendance is eligible to take the final exam.
Our goal is to provide an environment that is free of discrimination and harassment, as well as that supports you to become competent in transportation engineering. Therefore, we have the following expectations;

- Lectures should be treated as discussion sessions. Please be prepared to work and participate actively in every meeting
- You are encouraged to ask questions related to the content of this course.
- Additional aspects will be discussed in Week 1.

2.5. MSAF & Late Submission

In accordance with the MSAF policy in Section 7, the MSAF accommodation for this course will be to **grant an extension that matches the length of the absence** at the discretion of the supervisor and in consultation with the course coordinator. Late submissions that are not subject to the aforementioned criteria will lose 5% of the assignment/exercise grade for every late business day.

3. SCHEDULE (Tentative)

WEEK 1	Introduction to Transportation Planning	Assignment 1
WEEK 2	Transportation Planning Challenges	Exercise 01
WEEK 3	Transit Travel Characteristics	
WEEK 4	Public Transit Planning and Operations – part 1	Assignment 2
WEEK 5	Public Transit Planning and Operations – part 2	Assignment 3
WEEK 6	Public Transit Service Scheduling	Mid-Term
WEEK 7	Reading Week	
WEEK 8	Transportation Modelling: Trip Generation	Term Project Initiation
WEEK 9	Transportation Modelling: Trip Distribution	Exercise 02
WEEK 10	Transportation Modelling: Mode Choice	
WEEK 11	Transportation Modelling: Traffic Assignment	Assignment 4
WEEK 12	Introduction to ITS & Traffic Signals	
WEEK 13	Students Presentation, Conclusion, and Discussions	
FINAL EXAM*	Scheduled during the regular University Final Examination period established by the Registrar's Office	

* You must achieve at least 50% on the final exam to pass the course.

4. ASSESSMENT OF LEARNING	Weight %
Assignments 4 * 4.0% each	16%
Exercises 2 * 5.0% each	10%
Class Activity	4%
Class Discussions/Quizzes	5%
Term Project	25%
Mid-term	10%
Final Exam	30%
Total	100%

5. LEARNING OUTCOMES

Upon successful completion of this course, you will be able to:

- 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 signalized intersections and to determine optimal transit and traffic signal timing plans via calculation and microsimulation [CEAB Indicators 1.4 and 7.1]
- Apply the fundamental principles of traffic flow theory and the associated specialized traffic and transit engineering knowledge to solve unfamiliar problems pertaining to new developments or implementation of different traffic control strategies in transportation design [CEAB Indicator 3.2]

By achieving these objectives, you will be able to contribute meaningfully to the work that transportation engineers do, whether in a design office, government technical services, or in academia.

6. COMMUNICATION

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided email address or maintain a valid forwarding email address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by email to the student's designated primary email account via their "@mcmaster.ca" alias.
- Accept that forwarded emails may be lost and that email is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.
- All formal communications regarding this course will be through **McMaster email accounts** and/or **Avenue to Learn**. Please be sure to check your McMaster account regularly. If you have not received emails regarding **4T04**, it is your responsibility to contact the course coordinator with your McMaster email address and ensure your name is on the distribution list. Similar information will be posted on Avenue to Learn.

Periodically, you will be asked to **provide feedback on your own** experience during this course, including your opinion on the effectiveness of the lectures, tutorials, and assignments in contributing to your learning. This feedback will be solicited to help improve your experience, so it is in your best interest to make this feedback as informative, constructive, and respectful as possible.

7. POLICIES

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*, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/.

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 DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal the 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., online search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ONLINE ELEMENT

Some courses may use online elements (e.g. email, Avenue to Learn (A2L), 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 email 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 online 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

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 **must** visit 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.

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.

PROTECTION OF PRIVACY ACT (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades, and all other personal information at all times. For example, the submission and return of assignments and the posting of grades must be done in a manner that ensures confidentiality – see http://www.mcmaster.ca/univsec/fippa/fippa.cfm.

ANTI-DISCRIMINATION

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer, or the Human Rights Consultant, as soon as possible.
https://www.mcmaster.ca/policy/General/HR/Discrimination_and_Harassment.pdf

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, A2L and/or McMaster email.

8. MCMASTER 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