

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Spring/Summer 2022	
<b>Course Name</b>	Bridge Design, Maintenance & Repair	
<b>Course Code</b>	CIV TECH 4BD3	
<b>Date(s) and Time(s) of lectures</b>	Tuesday 6:30 p.m. - 9:30 p.m. May 2, 2022 – Aug 5, 2022	
<b>Program Name</b>	Civil Engineering Infrastructure Technology	
<b>Calendar Description</b>	<p>The McMaster University Faculty of Engineering and the Mohawk College School of Engineering Technology are collaborating in the development of a unique concept for the shared delivery of technological education in Ontario.</p> <p>The primary purpose of this endeavour is to offer Bachelor of Technology degree programs with a variety of technical specializations. This type of program is targeted to individuals whose technological interests are applications-oriented.</p>	
<b>Instructor(s)</b>	Andy Kikites, P.Eng.	E-Mail: Andy.Kikites@Metrolinx.com Office Hours & Location: N/A

### 2. COURSE SPECIFICS

<b>Course Description</b>	<p>This course covers the fundamental principles of bridge engineering with respect to design, maintenance and repair of common bridge types found in Ontario.</p> <p>Students will learn the terminology and standards required for the design/detailing of transportation projects relating to highways, bridges and culverts. Typical bridge project drawings will be introduced, highlighting industry design and draughting standards. Students will become familiar with current codes (CAN/CSA-S6 Canadian Highway Bridge Design Code, CHBDC), guidelines and standards through the use of various MTO (Ministry of Transportation) manuals, guidelines and specifications (ie. MTO Geometric Design Standards for Ontario Highways, MTO Structural Manual, MTO Concrete Culvert Design and Detailing Manual, MTO Structure Rehabilitation Manual, MTO Structural Planning Guidelines, OPSDs, etc.). The design process will be explained, with emphasis on how bridges fit into the overall transportation network design process.</p> <p>Students will take part in practical field sessions throughout the course with the goal of enabling them to take part in and conduct OSIM inspections and bridge condition surveys once working full-time.</p> <p>Students will be able to identify and name all components of transportation structures, and determine the appropriate structural system to be used for bridges according to the site topography and highway characteristics and sections. Preliminary bridge design methods will be covered in order to allow students to proportion bridge members, and produce detailed bridge sections in turn producing a General Arrangement drawing to initiate the detailed design phase of a bridge project. In addition, various methods of analysis will be covered enabling the student to calculate design forces to be used for detailed design of bridge components.</p> <p>The course will culminate in a term project that combines the information covered throughout the course along with aspects of the material covered in various other courses of the Civil</p>
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	<p>Engineering Infrastructure Technology program, resulting in the submission of a report and presentation of the work.</p> <p>Real world bridge projects will be used for assignments and terms projects in order to help students practice the above mentioned skills.</p>		
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	36
	L	Laboratory, workshop or fieldwork	
	T	Tutorial	
	DE	Distance education	
	<b>Total Hours</b>		36
<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	<p>CAN/CSA-S6: Canadian Highway Bridge Design Code          CAN/CSA-S6: Commentary on Canadian Highway Bridge Design Code          MTO Manuals below: <a href="http://www.library.mto.gov.on.ca/webopac/search.asp?mode=search">http://www.library.mto.gov.on.ca/webopac/search.asp?mode=search</a>          MTO Geometric Design Standards for Ontario Highways          MTO Structural Planning Guidelines          MTO Structure Rehabilitation Manual          MTO Structural Financial Analysis Manual          MTO Concrete Culvert Design and Detailing Manual          MTO Ontario Structure Inspection Manual (OSIM)          MTO Structural Manual          MTO Aesthetic Guidelines for Bridges          TAC Geometric Design Guide for Canadian Roads          OPSS &amp; OPSD: <a href="http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage">http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage</a></p>		
	<b>Other Supplies</b>	<b>Source</b>	
<b>Prerequisite(s)</b>	<p>CIV TECH 3SA3          CIV TECH 4SD3</p>		
<b>Corequisite(s)</b>	N/A		
<b>Antirequisite(s)</b>	N/A		
<b>Course Specific Policies</b>	<p>Students should be aware that, when they access the electronic components of this course, private information such as company names and locations shown or stated on drawings, reports and any other type of documentation are to remain confidential, and that all drawings, reports, etc. are to be used for the sole purpose of this course (i.e. educational purposes) and are not to be given to or used by third parties under any circumstances.</p> <p>Field work will be required for this course. As such, all personal protective equipment (i.e. hard hat, safety boots/shoes, safety vest, eye protection) is required to be worn during field work.</p> <p>Group work may be required for a major term project. This project is considered a mandatory evaluation component of the course.</p> <p>All assignments and projects are to be submitted at the start of the class (i.e. before the lecture begins) in which the assignment or project is due. All assignments and projects submitted after the start of class will be considered late and therefore subject to a 10% late penalty to be applied</p>		

	<p>towards the final assignment or project mark. Submission of assignments and projects the week(s) following the due date will not be accepted, resulting in a mark of 0%.</p> <p>Students must pass the final exam to pass the course.</p>	
<b>Departmental Policies</b>	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>	
<b>3. SUB TOPIC(S)</b>		
Week 1 May 3	Introduction to Bridges: Types, Components, Industry Standards	
Week 2 May 10	OSIM Inspections	
Week 3 May 17	OSIM Inspection of Bridge (Field Work)	10%
Week 4 May 24	OSIM Inspections (cont’d) → See A2L field inspection videos as samples	
Week 5 May 31	Condition Surveys – class lecture (Field Work) Methods of Bridge Repair: Concrete, Steel, Timber	
Week 6 June 7	Methods of Bridge Repair: Concrete, Steel, Timber (cont’d)	
Week 7 June 14	Mid-Term Exam	25%
Week 8 June 21	Loads: Types & Application Material Properties & Detailing Requirements	
Week 9 June 28	Preliminary Bridge Design: Selection of Type, Member Sizing Production of General Arrangement Drawing	
Week 10 July 5	Methods of Bridge Analysis and Design for Dead Load	
Week 11 July 12	Methods of Bridge Analysis and Design for Live Load	
Week 12 July 19	Project: Bridge Rehab & Replacement + Life Cycle Costing Analysis (in-class working session)	
Week 13 July 26	Project: Project Submission and Class Presentations	35%
Week 14 Aug 2	Final Exam (2.5 hours → 7:30pm-10:00pm)	30%
<p>Midterm Exam: June 14, 2022 (in class)                  Final Exam: August 2, 2022 (in class)                  All examinations MUST be written during the scheduled examination period.</p>		
<p>Note that this structure represents a plan and is subject to adjustment term by term.                  The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.</p>		

4. ASSESSMENT OF LEARNING *including dates*	Weight
Assignments	10%
Mid-term test	25%
Project	35%
Labs	0%
Final examination (tests cumulative knowledge)	30%
<b>TOTAL</b>	<b>100%</b>

Percentage grades will be converted to letter grades and grade points per the University calendar.

#### 5. LEARNING OUTCOMES

1. Ability to identify bridge components, different bridge types and appropriate uses for each.
2. Become familiar with industry codes, standards, manuals, guidelines and specifications.
3. Knowledge of various loads on bridges and their effects on the behaviour of the structure.
4. Ability to determine causes & mechanisms of deterioration for concrete, steel & timber bridges.
5. Ability to assess deterioration and level of severity as per OSIM requirements.
6. Ability to carry out OSIM inspections and full bridge condition surveys and interpret results for maintenance and repair planning.
7. Knowledge of various bridge repair and strengthening techniques and their applications.
8. Ability to determine the appropriate structural system to be used for bridges according to the site topography, etc., and through preliminary design produce detailed bridge sections.
9. Ability to perform preliminary design of bridges of various superstructure types and production of General Arrangement drawing to initiate detailed design.
10. Ability to analyze bridges using simplified methods of analysis in the CHBDC.
11. Ability to perform life cycle costing analysis of various rehabilitation options in order to determine optimal repair/maintenance program.
12. Use correctly the language of the industry, including but not limited to, scales, systems of measurement, standard practice in producing bridge drawings, and definition of plans, sections, profiles and schematic drawings.
13. Understand the design process for bridge engineering projects.
14. Understand how each area of specialization (highway, structural, municipal, etc.) fits into a transportation project and the roles each discipline plays.

#### 6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

##### 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.

[http://www.mcmaster.ca/policy/General/HR/Discrimination\\_Harassment\\_Sexual\\_Harassment-Prevention&Response.pdf](http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf)

##### 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: 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 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](http://www.mcmaster.ca/academicintegrity).

### **COURSES WITH AN ON-LINE ELEMENT**

Some courses may use on-line elements (e.g. e-mail, 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 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.

### **COMMUNICATIONS**

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 e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail 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.

### **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](mailto: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”.

### **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. <http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf>

### **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, A2L and/or McMaster email.