COURSE INFORMATION

Course Name: Engineering Systems   Course Code: CIVENG 3C03

Session Offered: Fall 2020

Calendar Description: Mathematical models and systems; economic comparison of projects; optimization; linear, nonlinear, and dynamic programming; simulation modelling. With an emphasis on transportation and other civil engineering applications.

Instructor(s): Mohamed Hussein, PhD, P.Eng   Phone: 905.525.9140 (Ext. 27463)

Email: husseinmo@mcmaster.ca   Office Hours/Contact: Fri 4:30–6:00 PM
                                                                              (virtual on MS teams)

Class Schedule Day(s): Wed, Fri (3:30 – 4:30 PM)   Location: (virtual on MS teams)

1. COURSE OBJECTIVES

This course is intended to provide an appreciation of system analysis and planning within the context of Civil Engineering practice. The following topics are covered in this course:

- Introduction to system approaches
- Linear programming (LP)
- Common LP problems in Civil Engineering
- Sensitivity analysis
- Dynamic programming
- Modelling and simulations
- Decision analysis

2. COURSE SPECIFIC POLICIES

- The lectures and the tutorial sessions will be delivered virtually using MS Teams. All students were added to a team on MS teams, named "CIVENG 3C03 Engineering Systems C01". Lectures and tutorials will be streamed live in dedicated channels during the scheduled class and tutorial times. Lectures and tutorials will be recorded and uploaded to the corresponding channels shortly after class ends.
- All formal communications regarding this course will be conducted through McMaster email accounts 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' email to the instructor or the TAs should include the course number and a relevant description in the subject line of the email (e.g., CIVENG3C03: 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
- To pass this course, you must score at least 40% of the final exam grade **and** submit at least 2 of the four assignments

3. SCHEDULE

WEEK	LECTURE 1	LECTURE 2
WEEK 1	Introduction	Introduction to Linear programing (LP)
WEEK 2	LP (Graphical solution)	LP (Simplex method)
WEEK 3	LP (Simplex method)	LP (Simplex method)
WEEK 4	Quiz # 1	LP (special cases)
WEEK 5	Sensitivity analysis	Sensitivity analysis

WEEK 6	Midterm recess	Midterm recess
WEEK 7	Midterm review	Midterm exam
WEEK 8	The transportation problem	The transportation problem
WEEK 9	The transportation problem (special cases)	The Assignment problem
WEEK 10	Dynamic Programing	Dynamic Programing
WEEK 11	Modeling and simulation	Modeling and simulation
WEEK 12	Modeling and simulation	Decision analysis
WEEK 13	Decision analysis	Final exam review
FINAL EXAMINATION	Scheduled during the regular University Final Examination period established by the Registrar's Office	

4. ASSESSMENT OF LEARNING	WEIGHT %
Assignments (4 assignments, 5% each)	20%
Quizzes (2 quizzes, 7.5% each)	15%
Midterm	20%
Final Exam	45%

5. LEARNING OUTCOMES

1) Learn important techniques and common optimization problems that are essential in managing Logistics and recognizing the limitations of different resources, including Linear Programming, Dynamic Programing, the Transportation Problem, and the Assignment Problem
   - ❖ CEAB attribute 11.2 *"Can plan and effectively manage time, resources, and scope"*

2) Use proper computer tools (e.g. Microsoft Excel) to solve the different optimization problems and understand the limitations associated with such tools
   - ❖ CEAB attribute 5.1 *"The ability to evaluate and select appropriate modern tools"*
   - ❖ CEAB attribute 5.2 *"The ability to use of modern / state of the art tools"*

3) Understand the role of modeling and simulation in addressing the uncertainty associated with certain components of Civil Engineering systems

4) Learn how to evaluate the standard statistical distributions and conduct Monte Carlo simulation using the proper computer tools (e.g. Microsoft Excel)
   - ❖ CEAB attribute 5.2 *"The ability to use of modern / state of the art tools"*

5) Learn the basic concepts of the decision-making process and concepts of decision making under uncertainty

6) Analyze the sensitivity of the optimal policy of engineering projects to a variety of factors, and understand the implications of such analysis on the project implementation, operation, and evaluation
   - ❖ CEAB attribute 11.3 *"Understands the business processes for implementing engineering ideas"*

7) Learn to provide written arguments to challenge/explain some concepts covered in the course material
   - ❖ CEAB attribute 7.3 *"Constructs effective written arguments"*

6. 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.

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 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.

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.

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 <u>cannot</u> 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 <u>or</u> 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.

COURSE OUTLINE

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