

**MBA O715
Simulation for Business Analytics
Winter 2024 Course Outline**

**Operations Management Area
DeGroot School of Business
McMaster University**

COURSE OBJECTIVE

This course is designed to introduce the basic concepts of system modeling and computer simulation addressing different aspects of business analytics. The process and methodology of using simulation for problem solving and decision-making are emphasized. MS Excel and simulation language Arena will be used as tools for model building. Students will be required to apply modeling and simulation techniques to a real-world problem in the industry of their choice (e.g. healthcare, retail, manufacturing, etc.) through a term project.

INSTRUCTOR AND CONTACT INFORMATION

**Section 1: Thur. 7:00 –
9:50pm
Dr. Kai Huang
Instructor**

khuang@mcmaster.ca
Office: RJC
Office Hours: before class
Tel: (905) 525-9140 x23449
Class Location: RJC 214

Student TA

Mingyao Song
songm45@mcmaster.ca

Office: Online
Office Hours: By appointment

Course website: <http://avenue.mcmaster.ca>

COURSE ELEMENTS

Credit Value: 3	Leadership: No	IT skills: Yes	Global view: No
Avenue: Yes	Ethics: No	Numeracy: Yes	Written skills: Yes
Participation: Yes	Innovation: Yes	Group work: Yes	Oral skills: No
Evidence-based: Yes	Experiential: Yes	Final Exam: No	Guest speaker(s): Yes

COURSE DESCRIPTION

Simulation is an analytics tool that can help businesses take the right decisions in the face of uncertainty. The McKinsey Global Institute has identified simulation as one of the essential techniques for analysing big data. This course teaches students how to develop and use data-driven simulation models using MS Excel and Arena.

The materials used in the course encompass a wide range of industries, businesses, and issues in order to provide the greatest depth and breadth of experience. Examples of applications can include financial planning and risk analysis, process management and improvement in healthcare and other service facilities, forecasting and strategy, resource allocation and scheduling, etc.

LEARNING OUTCOMES

Upon completion of this course, students will be able to complete the following key tasks:

- Acquire a comprehensive understanding of what simulation is and how it can be used to enhance decision-making
- Define requirements essential for building a simulation model based on an actual system
- Apply simulation models for better decision-making in service and industry settings
- Understand and interpret results of simple simulation models
- Demonstrate competence in using MS Excel as well as Arena for simulation (and other software)
- Provide an understanding of the assumptions, strengths & weaknesses of simulation models
- Demonstrate competence in collecting and interpreting data for the purpose of simulation and provide recommendations to improve the system based on the results of the simulation model

REQUIRED COURSE MATERIALS AND READINGS

Course Materials Are Available on Avenue To Learn

- <http://avenue.mcmaster.ca>

OPTIONAL COURSE MATERIALS AND READINGS

Excel Simulations. 2013. By Gerald Verschuuren.

Simulation with Arena, 7th Edition. 2024. By David Kelton, Nancy Zupick and Nathan Ivey

EVALUATION

In addition to measuring your performance in the course, the evaluation is designed to allow you to expose your written and analytical skills. Individual work will be designed to capture your unique problem solving and discussion skills. Through teamwork you will experience the complexity of simulation. Your final grade will be calculated as follows:

Components and Weights

Participation	Class attendance and engagement (individual)	10%
Assignments	Two assignments submitted (individual)	20%
Midterm Exam	One midterm exam (individual)	35%
Group Project	Group Report, models, presentation and data set files (group)	35%
Total		100%

All work will be evaluated on an individual basis except in project work. In project work group members will share the same grade adjusted by peer evaluation. Missed tests/exams will receive a grade of zero unless the student has submitted and been approved for a Notification of Absence or MSAF.

Class Participation

On each lecture, there is a participation score for each student, including quiz and class discussion participation.

Assignments

The assignments will be in the form of take-home assignments. You will have at least one week to submit the assignment. Assignments will be submitted on Avenue to Learn. Late assignments will be penalized. Tentative deadlines for assignments are as follows (the deadline may change based on the release date):

	(tentative) deadline
Assignment 1	February 27
Assignment 2	April 05

Midterm Exam

Midterm will be on **February 29 at 07:00PM in class**. There will be no lecture on Feb. 29.

Group Project

Objective

To gain experience on applying modern simulation technology for problem solving in business and industry.

Guidelines

- Students should form a team of up to six students to do a term project. All team members will be graded equally by default. However, depending on the reviews of all group members, each group member might receive a different score.
- Students with the help of the instructor will find a hypothetical problem for system modeling and simulation. The project should be carefully selected to demonstrate the meaningful use of simulation and to be completed in a reasonable amount of time. The project is done in Arena.
- The project proposed should be submitted to and be approved by the instructor.
- The submission includes one project report, one project presentation, Arena models and data set files.

Project Report, Arena models and Data sets [submitted online on Avenue].

Arena models and data sets used in the model should accompany the project report. The requirements for project report and presentation will be provided on Avenue.

Project Proposal

- The proposal report should include the project title, names of team members, the nature of the organization involved, and the brief description of the decision problem under study and the

objective of the simulation. The proposal should be typed with no more than two pages. The projects must be approved by the instructor by March 21.

NOTE: The use of a McMaster standard calculator is allowed during examinations in this course. See McMaster calculator policy at the following URL:

www.mcmaster.ca/policy/Students-AcademicStudies/UndergraduateExaminationsPolicy.pdf

Grade Conversion

At the end of the course your overall percentage grade will be converted to your letter grade in accordance with the following conversion scheme:

LETTER GRADE	PERCENT	POINTS
A+	90-100	12
A	85-89	11
A-	80-84	10
B+	75-79	9
B	70-74	8
B-	60-69	7
F	00-59	0

COMMUNICATION AND FEEDBACK

Students that are uncomfortable in directly approaching an instructor regarding a course concern may send a confidential and anonymous email to the respective Area Chair or Associate Dean:

<http://mbastudent.degroot.mcmaster.ca/contact/anonymous/>

Students who wish to correspond with instructors or TAs directly via email must send messages that originate from their official McMaster University email account. This protects the confidentiality and sensitivity of information as well as confirms the identity of the student. Emails regarding course issues should NOT be sent to the Administrative Assistant.

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.

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.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at:

www.mcmaster.ca/academicintegrity

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. 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

We may use on-line elements (e.g., e-mail, Avenue to Learn (A2L), etc.). Students should be aware that, when you 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.

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.

MISSED ACADEMIC WORK

Missed Mid-Term Examinations / Tests / Class Participation

Please do not use the online [McMaster Student Absence Form \(MSAF\)](#) as this is for Undergraduate students only. The MBA program will not accept an MSAF.

When students miss regularly scheduled term work which contributes 10% or more to the final grade, for legitimate reasons as determined by the Student Experience – Academic Office (SEAO), the activity necessary to compensate for the missed work will be determined by the course instructor. The compensatory activities assigned will vary with the nature of the course and the missed requirement. They include, but are not restricted to, an alternative assignment, a rescheduled midterm exam, or re-weighting the marks for the missed component to other mark components. Documentation explaining such missed work must be provided to the SEAO within five (5) working days of the scheduled date for completion of the work.

Acceptable reasons for missed work, along with the [Petition for Missed Term Work](#) and the [MBA Student McMaster University Student Health Certificate](#), can be found on the DeGroot MBA Student website (mbastudent.degroot.mcmaster.ca). Please direct any questions about acceptable documentation to the MBA Academic Advisors (askmba@mcmaster.ca).

University policy states that a student may submit a maximum of three (3) Petition for Missed Term Work per academic year, after which the student must meet with the Director of the program.

If term work is missed without an approved reason, students will receive a grade of zero (0) for that component.

Missed Final Examinations

Students must be available for the duration of the posted exam period regardless of their personal exam schedule. This is to ensure student availability throughout the entire exam period in the event that an exam must be rescheduled due to unforeseen circumstances (university closure, power outage, storm policy, etc.). A student who misses a final examination without valid reason will receive a mark of 0 on the examination.

Students who have missed a final exam for a valid reason can apply to the SEAO to write a deferred examination by submitting an Application for Deferring a Final Exam with supporting documentation. The application must be made within five days of the scheduled exam.

The Application for Deferring a Final Exam and the MBA Student McMaster University Student Health Certificate can be found on the DeGroot MBA Current Student website (mbastudent.degroot.mcmaster.ca)

Deferred examination privileges, if granted, are normally satisfied during the examination period at the end of the following semester. In select cases, the deferred examination may be written at a time facilitated by the SEAO and agreed to by the course instructor.

Requests for a second deferral or rescheduling of a deferred examination will not be considered.

ACADEMIC ACCOMMODATION FOR STUDENTS WITH DISABILITIES

Student Accessibility Services (SAS) offers various support services for students with disabilities. Students are required to inform SAS of accommodation needs for course work at the outset of term. Students must forward a copy of such SAS accommodation to the instructor normally, within the first three (3) weeks of classes by setting up an appointment with the instructor. If a student with a disability chooses NOT to take advantage of an SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. The SAS website is:

<http://sas.mcmaster.ca>

Students who are leveraging accommodation for tests and exams are supported by the SEAO. These exams are written at the Ron Joyce Centre and do not take place in the Tim Nolan Testing Centre. Correspondence for accommodations is managed via the DSBSAS@mcmaster.ca email

address. Students must communicate their intent to leverage accommodations on a test or exam a minimum of 10 business days prior to the assessment.

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 the SEAO **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation. 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.

POTENTIAL MODIFICATION TO THE COURSE

The instructor and 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. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

COURSE SCHEDULE

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DATE	TOPIC	DEADLINE
Jan. 11	L1 Introduction to Simulation	
Jan. 18	L2 Fundamentals of Probability Theory	
Jan. 25	L3 Discrete Probability Distributions	
Feb. 1	L4 Continuous Probability Distributions	
Feb. 8	L5 Dynamic Simulation	
Feb. 15	L6 Fundamental Simulation Concepts	
Feb. 22	Reading week (no class)	
Feb. 29	Midterm exam	
Mar. 7	L7 Basic Arena Simulation	
Mar. 14	L8 Advanced Arena Simulation I	
Mar. 21	L9 Advanced Arena Simulation II	Group Project Proposal Due: Mar. 21
Mar. 28	L10 Advanced Arena Simulation III	Guest Speaker: Mar. 28
Apr. 4	L11 Advanced Arena Simulation IV	Group Project Due: Apr. 10