

**MBA 0715
Simulation for Business Analytics
Winter 2022 Course Outline**

**Operations Management Area
DeGroote 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: Mon 07:00PM – 10:00PM

Dr. Behrouz Bakhtiari

Instructor

bakhtib@mcmaster.ca

Office Hours: By appointment

Tel: (905) 525-9140 x23998

Teaching Assistant

Hoang Bui

buih2@mcmaster.ca

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: Yes | Guest speaker(s): No |

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

- W. David Kelton, Randall P. Sadowski and Deborah A. Sadowski, Simulation with Arena, McGraw-Hill, 4th, 5th or 6th edition.

OPTIONAL COURSE MATERIALS AND READINGS

G. M. Verschuuren, Excel Simulations. Holy Macro! Books, 2013.

EVALUATION

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. Your final grade will be calculated as follows:

Components and Weights

| | | |
|----------------------|---|-------------|
| Assignments | Two assignments submitted (individual) | 16% |
| Midterm Exam | One midterm exam(individual) | 28% |
| Group Project | Group Report, models, presentation and data set files (group) | 18% |
| Final Exam | One final exam (individual) | 38% |
| Total | | 100% |

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 |

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 a dropbox 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 18 |
| Assignment 2 | March 28 |

Midterm Exam

Midterm will be on **March 07 at 07:00PM**. There will be no lectures on March 07.

Final Exam

The final exam is scheduled by the MBA office. The date will be announced as soon as it is determined by the university. The final exam is cumulative!

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 four students to do a term project. All team members will be graded equally.

- 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 Presentation (1%)

Project Report, Arena models and Data sets (17%) [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.

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.degrotee.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 DISHONESTY

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

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.

ON-LINE 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.

MISSED ACADEMIC WORK

Missed Mid-Term Examinations / Tests / Class Participation

Where students miss a regularly scheduled mid-term or class participation for legitimate reasons as determined by the Student Experience – Academic (MBA) office, the weight for that test/participation will be distributed across other evaluative components of the course at the discretion of the instructor. Documentation explaining such an absence must be provided to the Student Experience – Academic (MBA) office within five (5) working days upon returning to school.

To document absences for health related reasons, please provide to Student Experience – Academic (MBA) office the Petition for Relief for MBA Missed Term Work and the McMaster University Student Health Certificate which can be found on the DeGroote website at <http://mbastudent.degrote.mcmaster.ca/forms-and-applications/>. Please do not use the online McMaster Student Absence Form as this is for Undergraduate students only. University policy states that a student may submit a maximum of three (3) medical certificates per year after which the student must meet with the Director of the program.

To document absences for reasons other than health related, please provide Student Experience – Academic (MBA) office the Petition for Relief for MBA Missed Term Work and documentation supporting the reason for the absence.

Students unable to write a mid-term at the posted exam time due to the following reasons: religious; work-related (for part-time students only); representing university at an academic or varsity athletic event; conflicts between two overlapping scheduled mid-term exams; or other extenuating circumstances, have the option of applying for special exam arrangements. Such requests must be made to the Student Experience – Academic (MBA) office at least ten (10) working days before the scheduled exam along with acceptable documentation. Instructors cannot themselves allow students to unofficially write make-up exams/tests. Adjudication of the request must be handled by Student Experience – Academic (MBA).

If a mid-term exam is missed without a valid reason, students will receive a grade of zero (0) for that component.

Missed Final Examinations

A student who misses a final examination without good reason will receive a mark of 0 on the examination.

All applications for deferred and special examination arrangements must be made to the Student Experience – Academic (MBA) office. Failure to meet the stated deadlines may result in the denial of these arrangements. Deferred examination privileges, if granted, must be satisfied during the examination period at the end of the following term. There will be one common sitting for all deferred exams.

Failure to write an approved deferred examination at the pre-scheduled time will result in a failure for that examination, except in the case of exceptional circumstances where documentation has been provided and approved. Upon approval, no credit will be given for the course, and the notation N.C. (no credit) will be placed on the student's transcript. Students receiving no credit for a required course must repeat the course. Optional or elective courses for which no credit is given may be repeated or replaced with another course of equal credit value.

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

Any student who is unable to write a final examination because of illness is required to submit the Application for Deferred MBA Final Examination and a statement from a doctor certifying illness on the date of the examination. The Application for Deferred MBA Final Examination and the McMaster University Student Health Certificate can be found on the DeGroote website at <http://mbastudent.degrote.mcmaster.ca/forms-and-applications/> Please do not use the online McMaster Student Absence Form as this is for Undergraduate students only. Students who write examinations while ill will not be given special consideration after the fact.

In such cases, the request for a deferred examination privilege must be made in writing to the Student Experience – Academic (MBA) office within five business days of the missed examination.

Special examination arrangements may be made for students unable to write at the posted exam time due to compelling reasons (for example religious, or for part-time students only, work-related reasons):

- Students who have religious obligations which make it impossible to write examinations at the times posted are required to produce a letter from their religious leader stating that they are unable to be present owing to a religious obligation.
- Part-time students who have business commitments which make it impossible to write examinations at the times posted are required to produce a letter on company letterhead from the student's immediate supervisor stating that they are unable to be present owing to a specific job commitment.

In such cases, applications must be made in writing to the Student Experience – Academic (MBA) office at least ten business days before the scheduled examination date and acceptable documentation must be supplied.

If a student is representing the University at an academic or athletic event and is available at an overlapping scheduled time of the test/examination, the student may write the test/examination at an approved location with an approved invigilator, as determined by the Student Experience – Academic (MBA) office.

In such cases, the request for a deferred examination privilege must be made in writing to the Student Experience – Academic (MBA) office within ten business days of the end of the examination period.

Note: A fee of \$50 will be charged for a deferred exam written on campus and a fee of \$100 for deferred exams written elsewhere. In cases where the student's standing is in doubt, the Graduate Admissions and Study Committee may require that the student with one or more deferred examination privileges refrain from re-registering until the examination(s) have been cleared.

ACADEMIC ACCOMMODATION OF 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>

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.

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.

ACKNOWLEDGEMENT OF COURSE POLICIES

Your registration and continuous participation (e.g. on A2L, in the classroom, etc.) to the various learning activities of MBA 0715 will be considered to be an implicit acknowledgement of the course policies outlined above, or of any other that may be announced during lecture and/or on A2L. **It is your responsibility to read this course outline, to familiarize yourself with the course policies and to act accordingly.**

Lack of awareness of the course policies **cannot be invoked** at any point during this course for failure to meet them. It is your responsibility to ask for clarification on any policies that you do not understand.

ONLINE ELEMENT

In this course we will be using Avenue to Learn. Students should be aware that when they access the electronic components of this course, 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 this course will be deemed consent to this disclosure.

If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

COURSE SCHEDULE

MBA O715
Simulation for Business Analytics
Winter 2022 Course Schedule

Note: Depending on pace of lectures, the following schedule may change slightly.

| WEEK | DATE | TOPICS |
|------|---------|--|
| 1 | Jan. 10 | What is Simulation & Probability concepts, Simulation with MS Excel, Ch. 1, App. B & C + slides + handouts |
| 2 | Jan. 17 | Fundamental Simulation and probability Concepts Simulation with MS Excel, Ch. 2, App. B & C + slides + handouts |
| 3 | Jan. 24 | Fundamental Simulation and probability Concepts Simulation with MS Excel, Ch. 3 + slides + handouts |
| 4 | Jan. 31 | Simulation with MS Excel, Ch. 3 + slides + handouts |
| 5 | Feb. 07 | Simulation with MS Excel A guided tour through Arena, Ch. 3 + slides + handouts |
| 6 | Feb. 14 | Simulation with MS Excel Modeling Basic Operations and inputs, Ch. 4 + slides + handouts |
| 7 | Feb. 21 | Midterm recess (no classes) |
| 8 | Feb. 28 | Modeling Basic Operations and inputs, Ch. 4 + slides + handouts |
| 9 | Mar. 07 | Midterm exam (no class) |
| 10 | Mar. 14 | Modeling Detailed Operations, Ch. 5 + slides + handouts |
| 11 | Mar. 21 | Modeling Detailed Operations, Ch. 5 + slides + handouts |
| 12 | Mar. 28 | Analytics on output and Optimization, Ch. 6 + slides + handouts |
| 13 | Apr. 04 | Analytics on output and Optimization/additional simulation topics, slides |
| 14 | Apr. 11 | Additional simulation topics, slides |