

**MBA O711  
Predictive Modeling and 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 predictive analytics to MBA students. This course focuses on quantitative tools and methodologies to address the concept of “prediction” within business problems. Students of the course will learn about different aspects of predictive analytics using hands-on problem solving using the programming language R (and R studio), and Analytic Solver (an excel add-in). Upon completion of the course, students are expected to have developed an understanding of different tools involved in predictive analytics, and be able to conduct preliminary predictive analytics.

**INSTRUCTOR AND CONTACT INFORMATION**

Day and Time	Tuesdays 7:00pm to 10:00pm
Venue	RJC
Teaching Assistant	TBD
	TBD
Instructor	Dr. Manish Verma
	<a href="mailto:mverma@mcmaster.ca">mverma@mcmaster.ca</a>
	DSB415; Tel.: (905) 525-9140 #27438
	RJC
Office Hours	By appointment

**Course Website:** <http://www.business.mcmaster.ca/courses/O711/>

**COURSE ELEMENTS**

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

## COURSE DESCRIPTION

*Predictive Analytics* is one of the most important pillars of the business analytics domain. It is one of the most highly sought skills employers are seeking to fill. With advances in computing and computing power, new opportunities and capabilities have been envisioned for this field and there is a renewed and significant interest among businesses towards individuals with training in predictive analytics, especially those with hands-on experience and knowledge of computing software.

The materials used in the course encompasses a wide range of industries, businesses, and issues in order to provide the greatest depth and breadth of experience.

## LEARNING OUTCOMES

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

- Define essential requirements for building a predictive model based on data.
- Become familiar with key predictive analytics tools and techniques.
- Demonstrate the ability to apply statistics and analytical techniques to the given data set.
- Work in R software environment to build predictive models.
- Work in Analytic Solver, an excel add-in, to build predictive models.
- Demonstrate the knowledge and ability to apply different predictive analytics techniques to analyze the given managerial problem.
- Demonstrate competence in summarizing to “tell the story” of the data at hand and provide well-rounded recommendations and conclusion.

## REQUIRED COURSE MATERIALS AND READINGS

“*BUSINESS ANALYTICS: Communicating with Numbers*” by S. Jaggia, A. Kelly, K. Lertwachara, and L. Chen. McGraw-Hill.

- 6-month access to the Ebook is \$69. ISBN: 9781264518050
- Print version is \$129.95. ISBN: 9781260576016

## SOFTWARE APPLICATIONS

- R: Downloadable at [r-project.org](http://r-project.org)
- R studio: Downloadable at <https://rstudio.com/products/rstudio/download/>
- Analytic Solver ([www.solver.com](http://www.solver.com)). Product license will be purchased by DeGroote School of Business. Instructor will provide the codes that could be redeemed to have a 140-day access to the software.

<b>EVALUATION</b>
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**Assignments (50%)**

There will be 4 take-home assignments to be done in groups of 3-4 students. Each assignment could be either a set of numerical questions and/or a small case study. The group list is due before January 25, 2022 (7pm EST).

The assignments are due as per the following schedule.

- Assignment #1: Weight: 10%. Due: January 30, 2022; 10pm EST.
- Assignment #2: Weight: 10%. Due: February 22, 2022; 10pm EST.
- Assignment #3: Weight: 10%. Due: March 27, 2022; 10pm EST.
- Assignment #4: Weight: 20%. Due: April 15, 2022; 10pm EST.

**Term Test (20%)**

There will be one term test on March 01, 2022, during the regular class meeting time. It will be a 2-hour 30 minutes exam, and you will write this exam on your computer.

Please note that each student has to write the midterm test. If you are unable to write the exam on the scheduled date, and have advanced knowledge and permission, the instructor will provide you with an opportunity to write an alternate version of the test at an alternate time. *Note that this is not automatic and that a written request for alternate exam has to be made, along with the supporting documents, well ahead of the scheduled date.*

**Final Exam (30%)**

Final Exam will be held during the exam week, and more details will be provided in the class. It will be a 3-hour exam.

***Components and Weights<sup>1</sup>***

Assignments	(group)	50%
Term Test	(individual)	20%
Final Exam	(individual)	30%
Total		100%

<sup>1</sup> Any requests for a re-read of the assignments or examinations should be made within two weeks of the date of distribution of the marks.

## **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.degroote.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.

Instructors are encouraged to conduct an informal course review with students by Week #4 to allow time for modifications in curriculum delivery. Instructors should provide evaluation feedback for at least 10% of the final grade to students prior to Week #8 in the term.

## **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](http://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**

*This course will* 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).

## **ON-LINE ELEMENT**

*This course will* 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.

## **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 DeGroot website at <http://mbastudent.degroote.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 DeGroot website at <http://mbastudent.degroot.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.

## **STUDENT ACCESSIBILITY SERVICES**

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 OBSERVATIONS (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 MODIFICATIONS 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 O711 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.



<b>COURSE SCHEDULE</b>
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## MBA O711

### Predictive Modelling and Analytics

### Winter 2022 Course Schedule

WEEK	DATE	ASSIGNMENT
<b>1 to 3</b>	Jan. 11	<p><b><u>Data Preparation &amp; Overview of Statistics</u></b></p> <ul style="list-style-type: none"> <li>• Introduction to Business Analytics (Ch. 01)</li> <li>• Data Management and Processing (Ch.02)</li> <li>• Data Visualization and Summary Measures (Ch.03)</li> <li>• Probability and Probability Distributions (Ch.04)</li> <li>• Statistical Inference (Ch.05)</li> </ul> <p><b><u>Due:</u></b> Assignment # 1 (Jan. 30, 2022); 10pm EST</p>
	Jan. 18	
	Jan. 25	
	<b><u>Estimation and Prediction</u></b>	
Feb. 01	<ul style="list-style-type: none"> <li>• Regression Analysis (Ch.06)</li> <li>• Advanced Regression Analysis               <ul style="list-style-type: none"> <li>○ Interaction of variables (Ch.07.1)</li> <li>○ Logistic Regression (Ch.07.2)</li> <li>○ Cross-Validation Holdouts (Ch.07.3)</li> </ul> </li> </ul>	
Feb. 08	<ul style="list-style-type: none"> <li>○ Interaction of variables (Ch.07.1)</li> <li>○ Logistic Regression (Ch.07.2)</li> </ul>	
Feb. 15	<ul style="list-style-type: none"> <li>○ Cross-Validation Holdouts (Ch.07.3)</li> </ul>	
	Feb. 22	Reading Week
		<b><u>Due:</u></b> Assignment # 2 (Feb. 22, 2022); 10pm EST
7	Mar. 01	<b>Midterm Exam</b>
<b>8 to 12</b>		<b><u>Data Mining</u></b>
	Mar. 08	<ul style="list-style-type: none"> <li>• Introduction to Data Mining (Ch.08)</li> <li>• Supervised Data Mining (Ch.09)               <ul style="list-style-type: none"> <li>○ k-Nearest Neighbours</li> <li>○ Naïve Bayes</li> </ul> </li> </ul>
	Mar. 15	<ul style="list-style-type: none"> <li>• Supervised Data Mining: Contd. (Ch.10)               <ul style="list-style-type: none"> <li>○ Decision Trees</li> </ul> </li> </ul>
	Mar. 22	<b><u>Due:</u></b> Assignment # 3 (March 27, 2022); 10pm EST
	Mar. 29	<ul style="list-style-type: none"> <li>• Unsupervised Data Mining (Ch.11)               <ul style="list-style-type: none"> <li>○ Hierarchical Cluster Analysis</li> <li>○ <i>k</i>-Means Cluster Analysis</li> <li>○ Association Rule Analysis</li> </ul> </li> </ul>
Apr. 05	<ul style="list-style-type: none"> <li>○ Hierarchical Cluster Analysis</li> <li>○ <i>k</i>-Means Cluster Analysis</li> <li>○ Association Rule Analysis</li> </ul>	
<b>13</b>	Apr. 12	<ul style="list-style-type: none"> <li>• Forecasting with Time Series Data</li> </ul>
		<b><u>Due:</u></b> Assignment # 4 (April 15, 2021); 10pm EST