

**BUSADMIN O712**  
**Data Analytics with Python**  
**Fall 2024 Course Outline**

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

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***COURSE OBJECTIVE***

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This course is designed to cover different aspects of data analytics using the Python programming language environment and packages. Students will learn how to perform data preparation, conduct exploratory data analytics and visualization, build and evaluate statistical and machine learning models, etc., with business applications. Students will learn the concepts and methodologies by working on datasets from different resources, based on which they will generate insights that are helpful in making better data-driven business decisions. The course emphasizes hands-on work in implementing data analytics models using python. Prior experience of programming is **not** required.

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***INSTRUCTOR AND CONTACT INFORMATION***

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**Mon 11:30am – 2:30pm**  
**Instructor: Dr. Yun Zhou**  
[zhouy185@mcmaster.ca](mailto:zhouy185@mcmaster.ca)

Office: DSB-428 (Main campus)  
Office Hours: on Zoom (schedule to be posted on A2L), or by appointment  
Tel: (905) 525-9140 x27549  
Class Location: Classroom 357 in RJC

**TA: MohammadSadegh Soltani**  
[soltam4@mcmaster.ca](mailto:soltam4@mcmaster.ca)

***COURSE ELEMENTS***

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

***COURSE DESCRIPTION***

In this era of big data, the demand for data-literate professionals has been growing at a rapid pace, and data analytics has become a powerful tool for organizations across different industry sectors to improve their decision making.

This course aims at equipping students with essential skills and knowledge in data analytics. The topics to be discussed in the course include data manipulation and preparation, data visualization, statistical and machine learning models, testing and evaluation of the results, etc. The course takes an experiential-learning approach and will help students gain hands-on experience and develop a thorough understanding of the course materials using the Python programming language.

***LEARNING OUTCOMES***

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

- Become familiar with key data analytics tools and techniques, and understand on how and when each technique can be used to solve business problems.
- Acquire working knowledge and skills in Python, Jupyter Notebook and Jupyter Lab.
- Be able to perform data preparation and manipulation tasks.
- Be able to conduct exploratory analysis and data visualization.
- Demonstrate knowledge of different statistical and machine learning models for making predictions.
- Gain hands-on experience in building data analytics models and implement them using Python.
- Gain hands-on experience in validating and interpreting results from models.
- Demonstrate the ability to generate business insights based on results of data analytics models

***REQUIRED COURSE MATERIALS AND READINGS***

**Required:** Materials shared by the instructors (slides, handouts, etc.)

**Reference Textbooks (optional):**

- Practical Business Analytics Using R and Python, by Umesh R. Hodeghatta and Umesha Nayak (2<sup>nd</sup> edition, 2023)
- Python Data Analytics, by Fabio Nelli (2<sup>nd</sup> edition, 2018)
  - An electronic version is available for free at McMaster University Library website. You can obtain a free electronic copy at <http://library.mcmaster.ca> by logging in using your MAC ID and password
- An Introduction to Statistical Learning with Applications in Python, by Gareth James, et al.
  - An electronic version is available for free at <https://www.statlearning.com>.

The instructor may suggest other materials for improving students' skills in Python and data analytics.

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**EVALUATION**

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GRADE COMPONENT	WEIGHT	DESCRIPTION
Assignments	20%	2 Assignments (10% each)
Midterm Test	20%	
Group Project	30%	
Final Exam	30%	

## 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

## Course Deliverables

### ***Assignments (20%, individual work)***

The Assignments are carefully designed to help students keep up with the course material and prepare them for the midterm exam. There will be 2 assignments; dates are posted below under the Course Outline section. The Assignments will be released through Avenue to Learn. You will need to log in to Avenue to Learn to see the assignments on the course webpage. The assignments will be submitted online. Assignments will strictly be due on the scheduled date and time. Please allow for sufficient time to start and finish the homework assignment on time.

Late assignments will be penalized by 10% per day except under extraordinary circumstances. Please discuss any extenuating situation with your instructor at the earliest possible opportunity.

### ***Midterm (20%, individual work)***

Midterm exam is an individual assessment. It will be an open-book test. Students will complete the test with the assistance of their laptops. Use of generative AI is **not** allowed.

### ***Group Project (30%, group work)***

In this project, you will apply many of the topics learned in class to one or several datasets to conduct different tasks, build and evaluate models and produce insight. The project is a group work, and all group members be receiving the same mark. The project may involve other aspects (research, etc.) as well. The details of the requirements for the group project will be announced later in the term. The due date of the project will be announced on Avenue. Late submission will **not** be accepted.

### ***Final Exam (30%, individual work)***

The Final Exam covers all the topics covered in the course (with higher weight on the topics covered after the midterm), and will be scheduled by the Office of Registrar. The exam is open-book, but use of generative AI is **not** allowed.

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## **COMMUNICATION AND FEEDBACK**

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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.degrootemcmaster.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.

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## **ACADEMIC INTEGRITY**

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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

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### ***AUTHENTICITY/PLAGIARISM DETECTION***

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The course may use a web-based service (e.g., 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).

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

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This course uses 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.

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### ***ON-LINE PROCTORING***

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**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.

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## ***CONDUCT EXPECTATIONS***

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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.

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## ***MISSED ACADEMIC WORK***

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### ***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 DeGroote MBA Student website ([mbastudent.degroote.mcmaster.ca](http://mbastudent.degroote.mcmaster.ca)). Please direct any questions about acceptable documentation to the MBA Academic Advisors ([askmba@mcmaster.ca](mailto: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](http://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.

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## ***ACADEMIC ACCOMMODATION FOR STUDENTS WITH DISABILITIES***

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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](mailto: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.



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## ***ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)***

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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.

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## ***COPYRIGHT AND RECORDING***

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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.

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## ***POTENTIAL MODIFICATION TO THE COURSE***

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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.

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## ***ACKNOWLEDGEMENT OF COURSE POLICIES***

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Your registration and continuous participation (e.g. on A2L, in the classroom, etc.) to the various learning activities of MBA O712 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.

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**COURSE SCHEDULE**

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WEEK	DATE	ASSIGNMENT	KEY DATES
1	Mon. Sept. 9	Introduction to data analytics Python basics	
2	Mon. Sept. 16	Python basics (continued) Exploratory data analysis and visualization (part 1)	
3	Mon. Sept. 23	Exploratory data analysis and visualization (part 2)	
4	Mon. Sept. 30	<b>No</b> class on the National Truth and Reconciliation Day	
5	Mon. Oct. 7	Introduction to statistical learning Linear regression (part 1)	Assignment 1 will be due
6	Mon. Oct 14	Linear regression (part 2)	Group project will be released in this week
7	Mon. Oct 21	Midterm test (in class)	
8	Mon. Oct 28	Tree-based learning methods	
9	Mon. Nov. 4	Classification models (part 1)	

10	Mon. Nov. 11	Classification models (part 2)	Assignment 2 will be due
11	Mon. Nov. 18	Cross validation and bias-variance trade off	
12	Mon. Nov. 25	Unsupervised learning models	
13	Mon. Dec. 2	Selected advanced topics in machine learning and data analytics, which may include advanced visualization tools (e.g., plotly and python dash), neural networks and deep learning, etc.	Project report will be due by the end of the week

**Note:** Depending on class progress, the above schedule is subject to adjustment