



## Career and Professional Development Non-Credit Programs

### Course Outline

Course Title	Introduction to Computational Applied Statistics
Course Number	YCBS 272
Term	Summer 2019
Continuing Education Units	4 CEUs
Instructor	Arbaaz Khan
Contact Information	Email: <a href="mailto:arbaaz.khan@mail.mcgill.ca">arbaaz.khan@mail.mcgill.ca</a>  Office hours: Upon request
Course Description	<p>The objective of this course is to help learners develop an understanding of the descriptive and inferential statistics for data analysis. The students will develop the skills to perform and interpret data-driven decision making using statistical analysis. Each topic has a theoretical and practical (based on Python) section. This course will also equip the students with necessary tools to handle real world data.</p> <p>This course serves as a precursor to advanced Machine Learning algorithms based courses.</p> <p>The assignments must be submitted through either <i>MyCourses</i> or mailed directly to: <a href="mailto:arbaaz.khan@mail.mcgill.ca">arbaaz.khan@mail.mcgill.ca</a> Assignments submitted after the deadline will be penalized. No submissions will be accepted 8 hours past the deadline.</p>
Learning Outcomes	<p>Upon completion of this course, you should be able to:</p> <ul style="list-style-type: none"><li>• Understand the different types of data.</li><li>• Provide a descriptive analysis of the data, in both quantitative and qualitative form.</li><li>• Install, load, and use conventional Python libraries related to data analysis.</li><li>• Understand common distribution types.</li><li>• Formulate and make decisions based on hypothesis tests.</li><li>• Use Python to create and visualize a predictive model</li></ul>

## Course Material

### Required:

Course content (Lecture slides) and supporting reading material will be posted on MyCourses.

Reading assignments will also be provided through MyCourses.

### Optional:

The following books are recommended for additional reading:

1. **Introduction to Statistical Learning with Applications** in R, by G. James, D. Witten, T. Hastie, R. Tibshirani.  
The PDF of the book is freely available from: <http://www-bcf.usc.edu/~gareth/ISL/ISLR%20Fourth%20Printing.pdf>  
The printed version can be ordered online from amazon.ca  
*Also available as e-book through McGill Library.*
2. **Python for data analysis: data wrangling with Pandas, NumPy, and IPython** by Wes McKinney.  
Link: <https://mcgill.on.worldcat.org/oclc/1005138881>
3. **Practical statistics for data scientists: 50 essential concepts** by Peter Bruce & Andrew Bruce. Here is the link: <https://mcgill.on.worldcat.org/oclc/987251007>
4. **Probability & Statistics for Engineering and the Sciences**, 9<sup>th</sup> edition, Cengage Learning 2016.  
Available in McGill Library.

## Instructional Methods

Teaching and learning approach is experiential, collaborative and problem-based.

## EVALUATION

Item	%	Explanation
Attendance and Active Participation	10 %	<ul style="list-style-type: none"><li>This course consists of a community of learners of which you are an integral member; your active participation is therefore essential to its success. This means: attending class; visiting <i>MyCourses</i>, doing the assigned readings/exercises before class; and engaging in class discussions/activities.</li><li><b>A minimum attendance of 75% is required in order to pass the course.</b></li></ul>
Assignments	60 %	<p>3 Assignments will be posted as per the following schedule on <i>MyCourses</i>:</p> <ul style="list-style-type: none"><li>Assignment 1: Wednesday, July 31, 2019 (15%)</li><li>Assignment 2: Friday, Aug 02, 2019 (15%)</li><li>Assignment 3: Monday, Aug 05, 2019 (30%)</li></ul>
Quizzes	30 %	<p>4 In-class quizzes will take place on the following dates: Only 3 will be counted (best 3) <math>3 * 10\% = 30\%</math></p> <ul style="list-style-type: none"><li>Quiz 1: Wednesday, July 31, 2019</li><li>Quiz 2: Friday, Aug 02, 2019</li><li>Quiz 3: Mon, Aug 05, 2019</li><li>Quiz 4: Fri, Aug 09, 2019</li></ul>
<b>Total</b>	<b>100%</b>	

***In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.***

## UNIVERSITY POLICIES

### ***Academic Integrity***

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see [www.mcgill.ca/integrity](http://www.mcgill.ca/integrity) for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site [www.mcgill.ca/integrity](http://www.mcgill.ca/integrity)).

### ***Right to submit in English or French***

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives.

Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue).

### ***Email Policy***

E-mail is one of the official means of communication between McGill University and its students. As with all official University communications, it is the student's responsibility to ensure that time-critical e-mail is assessed, read, and acted upon in a timely fashion. If a student chooses to forward University e-mail to another e-mail mailbox, it is that student's responsibility to ensure that the alternate account is viable. Please note that to protect the privacy of students, the University will only reply to students on their McGill e-mail account.

## ADDITIONAL STATEMENTS

*McGill University is on land, which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. We acknowledge and thank the diverse Indigenous people whose footsteps have marked this territory on which peoples of the world now gather.*

*L'Université McGill est sur un emplacement qui a longtemps servi de lieu de rencontre et d'échange entre les peuples autochtones, y compris les nations Haudenosaunee et Anishinabeg. Nous reconnaissons et remercions les divers peuples autochtones dont les pas ont marqué ce territoire sur lequel les peuples du monde entier se réunissent maintenant.*

## RESOURCES

### ***Student Services***

Various services such as Walksafe, McGill Libraries, the Writing Centre, the Bookstore, etc., are available to Continuing Studies students:

<https://www.mcgill.ca/continuingstudies/current-students-1>

### ***Career Advising and Transition Services***

<https://www.mcgill.ca/continuingstudies/career-advising-and-transition-services>

### ***Students with Disabilities***

Students who have a documented disability and require academic accommodations and services should contact the Office of Students with Disabilities (<http://www.mcgill.ca/osd> or 514-398-6009) early in the term.

### ***Computer Labs***

Free access to computer labs is available at 688 Sherbrooke (12th floor), MACES, the McLennan Library and other locations on campus.

### ***Athena and Online Resources***

Access your personal student information online with Athena (<https://continuingstudies.mcgill.ca/portal/logon.do?method=load>).

Information regarding online resources such as email, VPN, myCourses, etc. can be found at ([www.mcgill.ca/it](http://www.mcgill.ca/it) ).

### ***MACES***

The McGill Association of Continuing Studies Students, MACES ([maces.ca](http://maces.ca)), is located at 3437 Peel, 2nd floor, tel. (514) 398-4974. <https://www.facebook.com/macesmcgill/>

## **GRADING SCHEME**

The following grading scheme applies to Non-Credit Transcript Professional Development Certificate programs.

Numerical Scale		Letter Grade
Pass	(85-100%)	A
	(80-84%)	A-
	(75-79%)	B+
	(70-74%)	B
	(65-69%)	B-
Failure	(0-64%)	F

**A minimum attendance of 75% is required in order to pass the course.**

## COURSE CONTENT

Class / Day/ Date	Topics / Assignments / Readings
<b>1</b> <b>Mon July 29, 2019</b>	Orientation
<b>2</b> <b>Tue July 30, 2019</b>	<u>Lecture 1:</u> Introduction, Fundamentals of descriptive statistics, Categorical & Numerical data exploration with histograms and scatter plots.
<b>3</b> <b>Tue July 30, 2019</b>	<u>Lecture 2:</u> Data Wrangling with Python using NumPy and Pandas library.
<b>4</b> <b>Wed July 31, 2019</b>	<b>Quiz 1</b> <u>Lecture 3:</u> Understanding asymmetry and variability in the data, skewness, Correlation.  <a href="#">Assignment 1</a>
<b>5</b> <b>Thu Aug 01, 2019</b>	<u>Lecture 4:</u> Data visualization with Matplotlib and Seaborn libraries.
<b>6</b> <b>Thu Aug 01, 2019</b>	<u>Lecture 5:</u> Practical case studies: Descriptive statistics: handling missing data, anomalies, feature selection; Introduction to scikit-learn.
<b>7</b> <b>Fri Aug 02, 2019</b>	<b>Quiz 2</b> <u>Lecture 6:</u> Introduction to Inference Statistics, Distributions: Normal, Binomials, Poisson, Central limit theorem
<b>8</b> <b>Fri Aug 02, 2019</b>	<u>Lecture 7:</u> Basics of Estimation Theory, Estimators, Confidence Interval, Student-T distribution  <a href="#">Assignment 2</a>
<b>9</b> <b>Mon Aug 05, 2019</b>	<b>Quiz 3</b> <u>Lecture 8:</u> Statistical Testing & Significance: A/B Testing, Hypothesis Testing, resampling and bootstrapping, etc  <a href="#">Assignment 3</a>
<b>10</b> <b>Tues Aug 06, 2019</b>	<u>Lecture 9:</u> Regression analysis with Python implementation, Practical Case studies – Inferential statistics.
<b>11</b> <b>Fri Aug 09, 2019</b>	<b>Quiz 4</b> <u>Lecture 10:</u> Presentations on Assignment 3.