Western Science

Department of Statistical and Actuarial Sciences

Data Science Concepts (DS 1000B)
Course Outline

1. Course Information

Course Name: Data Science Concepts
Course Number: DS1000B
Term: Winter 2023

	Day	Time	Location
Class			
Section 1	Tue Thu	8:30 AM – 9:30 AM 8:30 AM – 10:30 AM	TC141
Section 2	Mon/Wed/Fri	12:30 PM – 1:30 PM	WSC55
Section 3	Mon/Wed/Fri	2:30 PM – 3:30 PM	NCB101
Lab			
Section 4	Thu	4:30 PM – 5:30 PM	UCC37
Section 5	Tue	2:30 PM – 3:30 PM	NCB114
Section 6	Tue	3:30 PM – 4:30 PM	NCB114
Section 7	Tue	4:30 PM – 5:30 PM	UCC37
Section 8	Thu	2:30 PM – 3:30 PM	NCB114
Section 9	Thu	3:30 PM – 4:30 PM	UCC37

List of Prerequisites
One or more of Ontario Secondary School MCV4U, MHF4U, MDM4U, Mathematics 0109A/B, Mathematics 0110A/B, Mathematics 1229A/B, or equivalent.

List of Antirequisites
Statistical Sciences 1023A/B, the former Statistical Sciences 1024A/B.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees if you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Instructors	Email	Office	Office Hours
Ashley McAlpine (Sections 2/3) → Course Coordinator	amcalpi3@uwo.ca	WSC 274	MWF 10:00 AM – 11:00 AM
TBD (Section 1)	TBD	TBD	TBD

Teaching Assistants	Email	Office	Office Hours
Amirhossien Aminimanesh	aaminima@uwo.ca	TBD	TBD
Ana Carolina Da Cruz	adacruz@uwo.ca	TBD	TBD
Diba Daraei	ddaraei@uwo.ca	TBD	TBD
Pouya Faroughi	pfarough@uwo.ca	TBD	TBD
Ruimin (Jasmine) Gao	rgao96@uwo.ca	TBD	TBD
Jingyi Liu	jliu2388@uwo.ca	TBD	TBD
Yiyang Chen	yche89@uwo.ca	TBD	TBD
Yize Yuan	yyuan328@uwo.ca	TBD	TBD
Sahab Zandi	szandi@uwo.ca	TBD	TBD
Yishan Zang	yzang8@uwo.ca	TBD	TBD
Xinyi Zeng	xzeng85@uwo.ca	TBD	TBD

OWL Forum
All subject-specific questions must be asked in the OWL forum – this way all students can benefit from seeing the questions and help their peers by providing responses. The forum will be monitored on a regular basis and the TAs will interject with corrections or responses as necessary. As this is an open forum, please be respectful of your peers, instructor(s), and TAs. Derogatory, discriminatory, or otherwise inappropriate language or topics will be removed and dealt with at the instructor's discretion.

Email
Emails are reserved strictly for private and confidential communications. We will not answer any course-related questions via email. Students must use their Western (@uwo.ca) email addresses when contacting their instructors and be sure to indicate the course number (DS 1000) in the subject line.

3. Course Syllabus, Schedule, Delivery Mode

Description
Students will learn how to visualize and analyze continuous and categorical data from various domains, using modern data science tools. Concepts of distributions, sampling, estimation, confidence intervals, experimental design, inference, correlation will be introduced in a practical, data-driven way.

Course Objectives
By the end of this course, a successful student will be able to:
- Understand and correctly use foundational vocabulary associated with Statistics and Data Science.
- Interpret, create and critically evaluate graphical and numerical data summaries.
- Understand and appreciate probability, chance, randomness, and 'average'.
- Understand, assess, and critique the conclusions of data analyses.
- Apply concepts learned in this course to future courses, careers, and everyday life.

Lecture Schedule

Wk	Dates	Chapter	Class Topics	Lab Topics
1	Jan 9-13	Sections 1.1-1.6	- Categorical variables (pie charts, bar plots) - Quantitative variables (histograms, stem plots, time plots)	- Introduction to Python and Jupyter notebook - Data frames, arrays, types of variables
2	Jan 16-20	Sections 2.1-2.5	- Mean, Median - Quartiles - Five-number summary	- Basic Python commands and functions
3	Jan 23-27	Sections 2.5-2.8	- Interquartile range - Boxplots and spotting outliers - Standard deviation - Choosing measures of center and variability	- Import data - Histogram, pie chart, bar plot - Five-number summary - Boxplots - Calculating standard deviation
4	Jan 30 - Feb 3	Sections 3.1-3.8	- The normal distribution - The 68-95-99.7 rule - Finding Normal proportions	- Generating normal data and plotting the corresponding histogram - Calculating normal proportions
5	Feb 6-10	Sections 4.1-4.6	- Explanatory and response variables - Displaying relationships: scatterplots - Measuring linear correlation (Pearson's correlation coefficient)	- Scatterplot - Linear correlation (Python function for Pearson's correlation)
6	Feb 13-17	Sections 5.1-5.8 (excl 5.3)	- Regression lines - Least-squares regression lines - Examples of software regression output - Caution about correlation and regression - Association does not imply causation	- Least-squares regression fit - Interpretation of result table
7	Feb 20-24	Reading Week		
8	Feb 27 - Mar 3	Sections 6.1-6.3	- Two-way contingency table - Relative risk, odds ratio - Simpson's Paradox	- review for Mid-term on Mar 4
9	Mar 6-10	Sections 8.1-8.7 Sections 9.1-9.7	- Sampling - Observational studies versus random experiments	- From raw data to two-way table - Computing conditional and marginal proportions - Relative risk, odds ratio - Mosaic plot
10	Mar 13-17	Sections 12.1, 12.3-12.7	- Intro to probability	- Generating samples
11	Mar 20-24	Sections 13.1-13.6	- Rules of probability - Addition - Independence and multiplication rule - Conditional probability - Venn diagrams - Tree diagrams	- Venn diagrams
12	Mar 27-31	Sections 15.1-15.6	- Sampling distributions - Mean sampling distribution - Central limit theorem - Statistical significance	- Mean Sampling Distribution
13	Apr 3-7	Sections 16.1-16.4	- Quantifying estimation uncertainty - Confidence intervals (Cis) for population mean - Bootstrap confidence intervals	- Building normal based Cis - Bootstrap samples - Bootstrap Cis
14	Apr 10		- Cover any outstanding material	No Lab This Week

All classes and labs will be held in-person.

- In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e. at the times indicated in the timetable) or asynchronously (i.e. posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

4. Course Materials

Textbook
The Basic Practice of Statistics, 9th Ed, 2021, by D. S. Moore; W. I. Notz; M. l. Fligner

Students can order a physical copy through the Book Store's website or purchase an e-book version through the following link:
https://store.macmillanlearning.com/ca/product/The-Basic-Practice-of-Statistics/p/1319244378

OWL
Students are responsible for checking the course OWL site (http://owl.uwo.ca) on a regular basis for course material and updates. This is the primary method by which information will be distributed to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk by phone at 519-661-3800 or ext. 83800.

iClicker
iClicker will be used for in class feedback and non-graded assessments.
Follow the link: https://www.iclicker.com/ where you can install iClicker and join the class.

Technical Requirements
Python and Jupyter Notebook are the main tools for labs.

- Install Anaconda on your device: https://www.anaconda.com/products/distribution
- In the Anaconda Navigator desktop app, click on Jupyter Notebook.

If you need access to a computer for coursework, please contact the instructor as early as possible.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Component	Weight	Deadline
Lab Attendance	5%	n/a
Assignments x 4	15%	Feb 3, Feb 17, Mar 17, Apr 7
Mid-term (2 hrs)	30%	Mar 4 – to be confirmed by the Registrar's Office
Final Exam (3 hrs)	50%	TBD – to be scheduled by the Registrar's Office

Calculators: Any non-programmable calculator may be used in this course.

Format of Exams: In-person, closed-book, combination of multiple choice and short answer.

Labs:

- There are 13 labs; however, you only need to attend 10 to earn 5% of your grade (10 * 0.5%)

Assignments:

- There are 4 assignments; however, only the best 3 assignments will count towards your grade (5% each). Students must submit at least 2 out of the 4 assignments to write the final exam.

- Assignments will be available on the course OWL site. However, you will not submit your solutions to OWL. Instead, assignments must be submitted through Gradescope (https://www.gradescope.com/), an online collaborative grading system. It is your responsibility to make sure that your assignment is successfully uploaded and legible. Submissions that cannot be read by the grader will receive a grade of zero.

- Assignment submissions are due at 11:55 pm (Eastern Time) on the due date. No accommodations will be given for assignments, so do not reach out to your instructor with reasons why you missed a deadline.
    - Assignments that are up to 24 hours late will receive a grade deduction of 15%.
    - Assignments up to 48 hours late will receive a grade deduction of 30%.
    - No credit will be given for submissions beyond 48 hours of the deadline time.

- Solutions to assignments will not be posted; however, TAs will provide comments on incorrect answers using Gradescope, which will allow students to find out the correct solutions. In addition, students can ask the instructor and TAs for more details on solutions via the Regrade Request tool on Gradescope and during office hours.

- After receiving an assignment grade, students will have seven days to submit a regrade request using the Gradescope tool "Regrade Request". After this seven-day period, regrade requests will NOT be accepted.

Rounding of Marks Statement

Across the Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. ***Final grades*** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 WILL NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

6. Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade:

There will be no accommodations or make-ups for labs or assignments.

- You only need to attend 10 out of 13 labs (10 labs * 0.5% = 5% of your overall grade).
- You can drop one of the 4 assignments (3 assignments * 5% = 15% of your overall grade).

Assessments worth 10% or more of the overall course grade:

If you miss the mid-term, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

The Student Medical Certificate is available at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Students who obtain appropriate accommodation will have the weight of the mid-term redistributed to the final exam. There will be no other make-up for the mid-term.

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling Office of your Faculty of Registration as soon as possible. They will assess your eligibility to write the Special Examination (the name given by the University for a make-up Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g. more than 2 exams in 23-hour period or more than 3 exams in a 47-hour period).

7. Accommodation and Accessibility

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

Accommodation Policies
Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf.

8. Academic Policies

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

In the event of another health lock-down, the final exam in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (https://learning.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital/.

Additional student-run support services are offered by the USC, https://westernusc.ca/services/.