

# Data Science Concepts (DS 1000A) Course Outline

## 1 Course Information

**Course Name:** Data Science Concepts  
**Course Number:** DS1000A  
**Term:** Fall 2025

### 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, Statistical Sciences 2037A/B, Statistical Sciences 2857A/B, the former Statistical Sciences 1024A/B.

Unless you have either the prerequisites for this course or written special permission from the Department of Statistics and Actuarial Science to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

### Lecture schedule:

Section	Instructor	Days	Time	Location	Class Number
002	Daniel Guerrero Santaren	MWF	3:30–4:30 PM	AHB-1R40	4679
003	Pavel Shuldiner	Tu	11:30–1:30 PM	HSB-40	4680
		Th	11:30–12:30 PM	HSB-40	

### Lab schedule:

Section	Component	Days	Time	Location	Class Number
006	LAB	W	4:30–5:30 PM	BGSB-0153	4682
007	LAB	F	4:30–5:30 PM	BGSB-0153	4863
008	LAB	Tu	3:30–4:30 PM	BGSB-0153	4864
009	LAB	Th	3:30–4:30 PM	BGSB-0153	4865

## 2 Instructor Information

Instructor	Email	Office	Phone	Office Hours
Daniel Guerrero Santaren	<a href="mailto:dguerre4@uwo.ca">dguerre4@uwo.ca</a>	WSC-284	TBD	TBD
Pavel Shuldiner (Course Coordinator)	<a href="mailto:pshuldin@uwo.ca">pshuldin@uwo.ca</a>	WSC-284	TBD	TBD

Instructors' office hours and TA office hours will be posted on OWL. You are welcome to attend any instructor's office hours, not just those of your own section.

### 2.1 Piazza

[Piazza](#) serves as our primary communication platform, benefiting all students by creating a collaborative learning environment where questions and answers are visible to the entire class. This allows students to learn from each other's inquiries and receive assistance from both instructors and peers. When posting questions on Piazza, students have the option to remain anonymous to their classmates while remaining identifiable to instructors.

#### **Piazza Etiquette:**

- Place questions in the appropriate category (e.g., `logistics` for administrative questions, `a1—a4` for assignment questions, `regrade_request1—regrade_request4` for regrade requests)
- Search existing posts before asking new questions to avoid duplicates
- Be respectful and professional in all communications
- When posting code or error messages, include relevant context

### 2.2 Email

Students must use their Western (@uwo.ca) email addresses when contacting their instructors. **Piazza is the preferred communication platform for most course-related inquiries.** To help create an effective learning environment for all students, please follow these guidelines when posting.

#### **Public Posts (visible to all students)**

- Questions about course content, concepts, or materials
- Clarification requests regarding assignment instructions

#### **Private Posts (visible only to instructors)**

- Regrade requests
- Requests for academic accommodation or consideration
- Concerns about academic integrity or misconduct

When using private posts, you may direct your message to a specific instructor if needed. Reserve email communication for issues of a highly personal or confidential nature that cannot be addressed through Piazza, and please include "DS 1000" in the subject line.

### 3 Course Syllabus, Schedule, Delivery Mode

#### Course 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 Learning Outcomes

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 the concepts of probability, chance, randomness, and averages.
- Understand, assess, and critique the conclusions of data analyses.
- Apply concepts learned in this course to future courses, careers, and everyday life.

#### Tentative Course Schedule

Week	Chapter(s)	Topic	Lab Topics
Week 1 <i>Sept 4–5</i>	Introduction 1.1 – 1.2	<ul style="list-style-type: none"><li>• About the course</li><li>• What is data science?</li><li>• What is data?</li></ul>	<i>(No lab this week)</i>
Week 2 <i>Sept 8–12</i>	1.1 – 1.6 continued	<ul style="list-style-type: none"><li>• Categorical variables (pie charts, bar plots)</li><li>• Quantitative variables (histograms, stem plots, time plots)</li></ul>	<ul style="list-style-type: none"><li>• Google Colab setup</li><li>• Python basics: variables and data types; lists; functions; if statements</li></ul>
Week 3 <i>Sept 15–19</i>	2.1 – 2.8	<ul style="list-style-type: none"><li>• Mean, Median</li><li>• Quartiles, Interquartile range</li><li>• Five-number summary</li><li>• Boxplots and spotting outliers</li><li>• Standard deviation</li><li>• Choosing measures of center and variability</li></ul>	<ul style="list-style-type: none"><li>• Python programming: loops, NumPy, Pandas</li><li>• Arrays and dataframe manipulation</li></ul>

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<b>Week</b>	<b>Chapter(s)</b>	<b>Topic</b>	<b>Lab Topics</b>
Week 4 <i>Sept 22–26</i>	3.1 – 3.8	<ul style="list-style-type: none"> <li>• The normal distribution</li> <li>• The 68–95–99.7 rule</li> <li>• Finding normal proportions</li> </ul>	<ul style="list-style-type: none"> <li>• Importing data</li> <li>• Plotting packages (Matplotlib, Seaborn)</li> <li>• Histograms, pie charts, bar plots, box-plots</li> <li>• Descriptive statistics</li> </ul>
Week 5 <i>Sept 29–Oct 3</i>	4.1 – 4.6	<ul style="list-style-type: none"> <li>• Explanatory and response variables</li> <li>• Scatterplots</li> <li>• Measuring linear correlation</li> </ul> <p><b>A1 due Monday, Sept 29 at 8 PM</b></p>	<ul style="list-style-type: none"> <li>• Generating normal data and plotting the corresponding histogram</li> <li>• Calculating normal proportions</li> <li>• The 68–95–99.7 rule</li> </ul>
Week 6 <i>Oct 6–10</i>	5.1 – 5.8, excl. 5.3	<ul style="list-style-type: none"> <li>• Regression lines</li> <li>• Least-squares regression lines</li> <li>• Examples of software regression output</li> <li>• Caution about correlation and regression</li> <li>• Association does not imply causation</li> </ul>	<ul style="list-style-type: none"> <li>• Scatterplot and pairplot</li> <li>• Linear correlation (Python function for Pearson’s correlation)</li> <li>• Correlation heatmap</li> </ul>
Week 7 <i>Oct 13–17</i>	6.1 – 6.3	<ul style="list-style-type: none"> <li>• Two-way contingency table</li> <li>• Relative risk, odds ratio</li> <li>• Simpson’s Paradox</li> </ul> <p><b>A2 due Monday, Oct 13 at 8 PM</b></p>	<ul style="list-style-type: none"> <li>• Least-squares regression fit</li> <li>• Interpretation and visualization of regression</li> <li>• Influential points and outlier</li> </ul>
Week 8 <i>Oct 20–24</i>	8.1 – 8.7	<ul style="list-style-type: none"> <li>• Sampling</li> </ul>	<ul style="list-style-type: none"> <li>• From raw data to two-way table</li> <li>• Computing conditional and marginal proportions</li> <li>• Mosaic plot</li> <li>• Relative risk, odds ratio</li> </ul>

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Week	Chapter(s)	Topic	Lab Topics
Week 9 <i>Oct 27–31</i>	9.1 – 9.7	<ul style="list-style-type: none"> <li>• Observational studies versus random experiments</li> </ul> <p style="color: red;">Midterm Sunday Nov 2nd, 1:00 PM</p>	<ul style="list-style-type: none"> <li>• Sampling methods: simple random, systematic, and stratified</li> </ul>
Week 10 <i>Nov 3–7</i>	Reading Week		<i>(No lab this week)</i>
Week 11 <i>Nov 10–16</i>	12.1 – 12.7, excl. 12.2	<ul style="list-style-type: none"> <li>• Introduction to probability</li> </ul> <p style="color: red;">A3 due Monday, Nov 10 at 8 PM</p>	<ul style="list-style-type: none"> <li>• Sets</li> <li>• Basic probability rules</li> <li>• Venn diagrams</li> </ul>
Week 12 <i>Nov 17–21</i>	13.1 – 13.6	<ul style="list-style-type: none"> <li>• Rules of probability</li> <li>• Independence and multiplication rule</li> <li>• Conditional probability</li> <li>• Venn and tree diagrams</li> </ul>	<ul style="list-style-type: none"> <li>• Sampling distribution of the sample mean</li> <li>• Central limit theorem</li> </ul>
Week 13 <i>Nov 24–28</i>	15.1 – 15.6	<ul style="list-style-type: none"> <li>• Sampling distributions</li> <li>• Mean sampling distribution</li> <li>• Central limit theorem</li> <li>• Statistical significance</li> </ul>	<ul style="list-style-type: none"> <li>• Normal distribution confidence intervals (CLT-based)</li> <li>• Bootstrap confidence intervals</li> </ul>
Week 14 <i>Dec 1–5</i>	16.1 – 16.4 32.3 – 32.4	<ul style="list-style-type: none"> <li>• Estimation uncertainty and confidence intervals</li> <li>• Bootstrap methods</li> </ul>	<i>(No lab this week)</i>
Week 15 <i>Dec 8–9</i>	32 continued	<p style="color: red;">A4 due Monday, Dec 8 at 8 PM</p>	<i>(No lab this week)</i>

### Key Sessional Dates:

- First day of lectures: September 4, 2025
- Fall Reading Week: November 3–9, 2025
- Last day of lectures: December 9, 2025
- Examination period: December 11–22, 2025

## 4 Course Materials

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

The textbook costs \$149.85 (physical copy) or \$89 (e-book version). Students can order using this [link](#).

The e-book access code is **ppymbm**. While the textbook provides additional practice problems and context, **it is not required for this course**. All essential material will be covered in lectures and provided through course resources on OWL. Students who choose to purchase the textbook are welcome to use earlier editions, though some practice exercise numbers may differ.

### Technical Requirements

Python and Google Colab are the main tools for labs. The first lab will help you get everything set up on your computer.

### OWL

All course material will be posted to [OWL](#).

Students are responsible for checking the [course OWL site](#) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

The instructor has posted the following materials on the OWL site:

- Detailed lecture slides with additional content in the presenter notes.
- Practice exercises at the end of each lecture slide deck with solutions in the presenter notes.
- Videos to help guide you through the labs (Python element of the course); a TA is currently improving the lab videos, so two or more lab videos will be made available at the beginning of each week.

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

## 5 Methods of Evaluation

### Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Component	Weight	Deadline
Assignments	15%	due Sept 29, Oct 13, Nov 10, Dec 8 (8:00 PM)
Midterm	35%	Sunday November 2nd, 1:00 PM.
Final Exam	50%	Dec 11 – 22, to be scheduled by the RO

### Minimum Grade Requirement

To pass this course, you must achieve a minimum **assessment grade** of 50%. Your assessment grade is calculated as follows:

- If your final exam grade exceeds your midterm grade, your assessment grade is based on the final exam only (85% weighting)
- Otherwise, your assessment grade is based on both the midterm (35%) and final exam (50%)

Mathematically, the assessment grade is

$$\max(0.35 \times M + 0.50 \times E, 0.85 \times E) \times \frac{100}{85},$$

where  $M$  is your midterm grade and  $E$  is your final exam grade (both out of 100).

**Important:** If your assessment grade falls below 50%, your final course grade will equal your assessment grade, and assignment scores will not be included in the calculation.

## 5.1 Assignment Structure

Four assignments will be distributed throughout the semester, each weighted at 5% of the final grade. The highest three assignment scores will be counted toward the final grade calculation. All assignments will be posted on OWL and submitted via [Gradescope](#). Students may work together on assignments, but each student must submit their own individual work.

## 5.2 Assessment Format and Structure

All examinations are conducted in a closed-book format and consist of true/false, multiple-choice, and short-answer questions.

- The midterm examination covers material from Chapters 1–6
- The final examination is comprehensive, covering all course material
- Detailed examination information will be provided prior to each assessment

### Assignments

- **Resubmissions:** Each assignment may be resubmitted *once* after grading to correct errors. The resubmission grade will replace the original grade, except that any late penalties applied to the original submission will remain in effect. Resubmissions must be submitted *within one week* using **Piazza** of the graded assignment being returned. Late resubmissions will not be accepted.
- **Provisional Solutions:** Assignment solutions may be released before the resubmission deadline. Students who resubmit their assignments must complete revisions independently without consulting posted solutions until after submitting their resubmission. Students who access the posted solutions forfeit their opportunity to resubmit.
- **Late submissions:** Assignments submitted 48 hours after the assignment deadline will **not** be accepted.

**Weight shifting:** Your lowest assignment grade will be dropped (so only your best 3 assignments will count towards your final grade). Also, if your midterm grade is lower than your final exam grade, then your midterm weight will be shifted to the final exam (making it worth 85% of your course grade).

### 5.3 General information about missed coursework

Due to the weight shifting policy described above, students do not need to submit petitions for academic consideration for missed assignments or the midterm exam. The automatic dropping of the lowest assignment grade and the shifting of midterm weight to the final exam (when beneficial) provides built-in accommodation for these assessments. Additionally, there is no need to submit supporting documentation for missed assignments or the midterm exam.

The weight of a missed midterm is automatically shifted to the final exam and the lowest assignment grade (even if it is a missed assignment) is automatically dropped.

### 5.4 General information about missed coursework

No additional academic consideration will be granted for missed assignments or the midterm exam beyond the existing flexibility described above.

Students must familiarize themselves with the university [Policy on Academic Consideration](#) for Undergraduate Students in First Entry Programs, posted on the Academic Calendar.

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person. Students experiencing longer-term impacts on their academic responsibilities should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the [Office of the Registrar's webpage](#).

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this, and therefore **always** require formal supporting documentation:

- Midterm
- Final exam

When a student mistakenly submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above or those in the Coursework with Assessment Flexibility section below, the request cannot be recalled and reapplied. This privilege is forfeited.

### 5.5 Evaluation Scheme for Missed Assessments

- Assignments: the lowest assignment grade will be dropped. Should extenuating circumstances arise, students do not need to request Academic Consideration and they are permitted to submit their assignment up to 48 hours past the deadline without a late penalty. Assignments submitted **more than** 48 hours past the deadline will **not** be accepted.
- Midterm: No make-up midterm examination will be offered. For students with approved academic consideration, the weight of the missed midterm will be automatically transferred to the final examination.

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)).

## 5.6 Essential Learning Requirements

Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade.

### Minimum Grade Requirement

To pass this course, you must achieve a minimum **assessment grade** of 50%. Your assessment grade is calculated as follows:

- If your final exam grade exceeds your midterm grade, your assessment grade is based on the final exam only (85% weighting)
- Otherwise, your assessment grade is based on both the midterm (35%) and final exam (50%)

Mathematically, the assessment grade is:

$$\max(0.35 \times M + 0.50 \times E, 0.85 \times E) \times \frac{100}{85}.$$

where  $M$  is your midterm grade and  $E$  is your final exam grade (both out of 100).

**Important:** If your assessment grade falls below 50%, your final course grade will equal your assessment grade, and assignment scores will not be included in the calculation.

## 6 Additional Statements

### 6.1 Religious Accommodation

When conflicts arise with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible, but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test). Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays - <https://www.edi.uwo.ca>

### 6.2 Academic 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 on the university website.

### 6.3 General Academic Policies

Additional information is available on the [Registrar Services website](#). Use of @uwo.ca email: In accordance with [policy](#), the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account

holder to ensure that emails received from the University at their official university address are attended to in a timely manner. Requests for Relief (formally known as appeals).

Policy on Request for Relief from Academic Decision can be found [here](#).

Procedures on Request for Relief from Academic Decision (Undergraduate) can be found [here](#).

## 6.4 Scholastic Offences

Scholastic offences are taken seriously and students are directed to read the appropriate [policy](#). Procedures on Scholastic Offences (Undergraduate) can be found [here](#).

### Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a scholastic offence, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

### Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

## 6.5 Support Services

Please visit the [Science & Basic Medical Sciences Academic Advising webpage](#) for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters.

Students who are in emotional/mental distress should refer to [Mental Health @ Western](#) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about [support](#)

[services for survivors](#), including emergency contacts. To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto: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. If you have any questions regarding accommodations, you may also wish to contact [Accessible Education](#).

Learning-skills counsellors at [Learning Development and Success](#) 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.

Additional student-run support services are offered by the [USC](#).