



Western Science

Department of Biology
and

Department of Statistical & Actuarial Sciences Biology/Statistics 2244A – “Statistics for Science”

Course outline for Fall 2022



Western University is committed to a **thriving campus**. We encourage you to check out the [Digital Student Experience](#) website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: <https://www.uwo.ca/health/>. Students who are in emotional/mental distress should refer to Mental Health@Western (<http://uwo.ca/health/>) for a complete list of options about how to obtain help.

Course Information

Biology/Statistics 2244A, sections 001 and 002, FW22

An introductory course in the application of statistical methods, intended for honours students in departments other than Statistical and Actuarial Sciences, Applied Mathematics, Mathematics, or students in the Faculty of Engineering. Topics include sampling, confidence intervals, analysis of variance, regression and correlation. Cannot be taken for credit in any module in Statistics, Actuarial Science, or Financial Modelling other than in Applied Statistics.

List of Prerequisite(s)

1.0 mathematics course, or equivalent numbered 1000 or above. Data Science 1000A/B or the former Statistical Sciences 1024A/B or Integrated Science 1001X can be used to meet 0.5 of the 1.0 mathematics course requirement.

List of Antirequisite(s)

All other courses in Introductory Statistics (except Statistical Sciences 1023A/B, Data Science 1000A/B, or the former Statistical Sciences 1024A/B): Economics 2122A/B, Economics 2222A/B, Geography 2210A/B, Health Sciences 3801A/B, MOS 2242A/B, Psychology 2811A/B or the former Psychology 2810, Psychology 2801F/G or the former Psychology 2820E, Psychology 2830A/B, Psychology 2850A/B, Psychology 2851A/B, Social Work 2207A/B, Sociology 2205A/B, Statistical Sciences 2035, Statistical Sciences 2141A/B, Statistical Sciences 2143A/B, Statistical Sciences 2858A/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 in the event that you are dropped from a course for failing to have the necessary prerequisites.

Important Dates



Classes Start	Add deadline	Drop Deadline*	Classes End	Exam Period
Sept 8	Sept 16	Nov 12	Dec 8	Dec 10-22

*Last day to drop a first-term half course or first-term full course on campus and Distance Studies without academic penalty.

Instructor Information



Course Coordinator

Jennifer Peter (she/her)

Contact Information

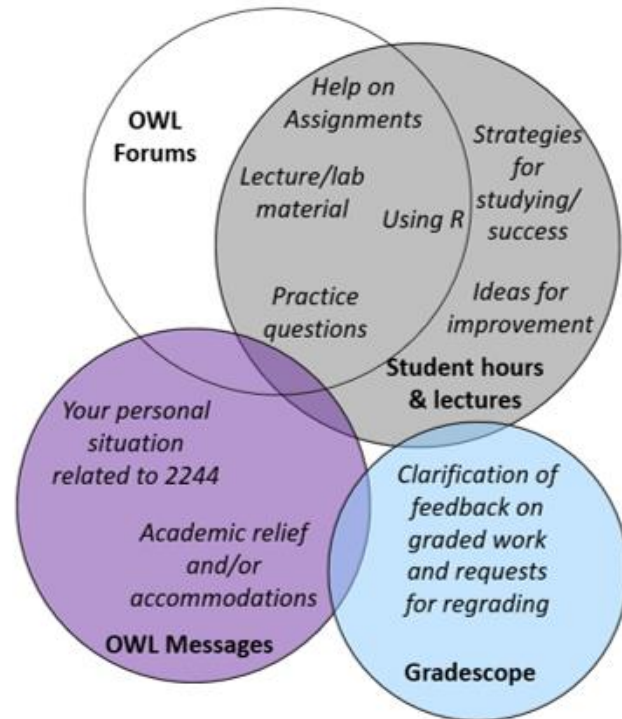
Use *OWL Messages* to
“Jennifer Peter (Instructor)”

My email address is similar to someone else’s; using the OWL Messages tool avoids lost/missed communication. It also ensures that you use your UWO contact information to connect with me.

Student Hours

These are times to meet with your instructor to get help, chat, etc. will occur at regular times weekly (in person and/or through Zoom), as determined by a student poll during the first days of term. Additional help sessions with TAs will also be scheduled to support certain aspects of the course. Dates/times will be communicated through the OWL Calendar tool, and by email to students.

Have questions/concerns? Find the best contact method below



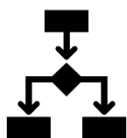
Course Schedule and Delivery Mode

Universal Design for Learning

UDL

This course has been designed using principles of **Universal Design for Learning** (“UDL”), which “focuses on eliminating barriers through initial designs that consider the needs of diverse people”¹. Consequently, you will encounter choice for many parts of the course: course content will be available in multiple formats, some assessments will offer a choice of topic/approach, and, diagnostic assessments will be available for most course topics to help you efficiently allocate your time for learning the course material.

Delivery of course material



This course is timetabled as an “in-person” course; I use a *blended* delivery format, meaning that some aspects of the course are taught/administered in person (“face to face”)—like lectures and tests/exams—while other aspects of the course are taught/administered online (e.g. labs, many assessments). This means that having a reliable internet connection, and, ideally, dedicated access to a laptop or computer is important for the course.

¹ Novak, K. and T. Thibodeau. 2016. UDL in the Cloud: How to design and deliver online education using Universal Design for Learning. CAST, Inc., Wakefield, Massachusetts.

Contingency plan for an in-person class pivoting to 100% online learning. 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 below) or asynchronously (e.g. 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.

Timetable

In-person lectures occur weekly for two lecture sections:

- Section 001: Mondays and Wednesdays, 10:30 am to 11:20 am in AHB 1R40
- Section 002: Tuesdays and Thursdays, 4:30 pm to 5:20 pm in NS 145

There is a 3-hour lab section weekly in each student's timetable, as listed below. **We do not formally use these timetabled lab periods.** Occasionally, Teaching Assistants (TAs) will be available during some of the lab sections to support aspects of the course; when/where and for what purpose these TA help sessions will occur will be communicated through the OWL course site.

- Section 004: Tues, 6:30-9:20 pm, HSB 16
- Section 005: Wed, 6:30-9:20 pm, HSB 14
- Section 006: Wed, 6:30-9:20 pm, NCB 105
- Section 007: Thurs, 6:30-9:20 pm, HSB 16
- Section 008: Thurs, 6:30-9:20 pm, HSB 14
- Section 009: Fri, 11:30 am-2:20 pm, HSB 16
- Section 010: Tues, 1:30-4:20 pm, HSB 13
- Section 011: Tues, 1:30-4:20 pm, HSB 16
- Section 012: Thurs, 1:30-4:20 pm, HSB 16
- Section 013: Thurs, 1:30-4:20 pm, HSB 14
- Section 014: Tues, 6:30-9:20 pm, HSB 14
- Section 015: Thurs, 6:30-9:20 pm, NCB 105
- Section 016: Tues, 6:30-9:20 pm, NCB 105

Learning Outcomes

This course is meant to be both introductory and fairly comprehensive, conceptual and practical. The course is fundamentally organized to **demonstrate that statistics is a scientific discipline that can and should inform research at all stages**, from problem definition through data interpretation and conclusion. To reinforce this over-arching learning outcome, the course topics are organized around a “backbone” based on the PPDAC framework for scientific inquiry.² In addition, there are some aspects of the course designed to promote development of metacognition. These overarching goals are reflected in the course-level learning outcomes.

By the end of the course, a successful student should be able to meet the learning outcomes described below:

² Mackay, R.J., and R.W. Oldford. 2000. Scientific method, statistical method, and the speed of light. *Statistical Science* 15(3): 254-278.

<p>Design sampling and study procedures to collect relevant data addressing a research question.</p>	<ul style="list-style-type: none"> • Distinguish among common sampling and study designs. • Identify issues associated with sampling and study design (e.g. bias, validity, confounding, control, reproducibility, power/effect size) • Identify relevant inference procedures based on research question, and, type and number of variables.
<p>Create and interpret appropriate summaries of data.</p>	<ul style="list-style-type: none"> • Select summaries based on research question and variables. • Interpret common graphical and numerical summaries to identify and/or describe patterns, trends, and interesting features in data.
<p>Analyse data using inference procedures to address a research question.</p>	<ul style="list-style-type: none"> • Select appropriate inference procedures for a research question. • Interpret and describe confidence intervals and hypothesis test results. • Evaluate the fit of models for common parametric inference procedures. • Recognize situations and data that may require alternative (i.e. not covered in this course) inference procedures.
<p>Use statistical software to explore, summarize, analyse, interpret, and communicate data.</p>	<ul style="list-style-type: none"> • Use R to create and modify graphical and numerical summaries of data. • Use R to conduct common parametric inference procedures, including evaluating conditions for model fit. • Interpret R (including accompanying code) or other statistical software output correctly.
<p>Communicate statistical concepts, analyses, and arguments in an accurate and scholarly manner.</p>	<ul style="list-style-type: none"> • Apply vocabulary to describe statistical concepts, procedures, and ideas. • Use conventional and transparent formats for reporting results of statistical analyses in written/graphical form. • Justify the choice of statistical procedures (e.g. selected study designs).
<p>Describe models and/or conceptual background for common inference procedures.</p>	<ul style="list-style-type: none"> • Describe the models for common inference procedures. • Describe sampling distributions (based on simple random samples) for commonly used statistics (e.g. means, proportions).
<p>Engage in practices that support the development of metacognition</p>	<ul style="list-style-type: none"> • Use previous experiences as a starting point to evaluate current or future actions • Identify assumptions or obstacles that may present challenges when learning • Reflect on learning experiences to evaluate how the learner has adapted or changed

Course Schedule

Some adjustments to this schedule may be made based on our progression through the material; any changes to due dates will be announced on OWL.

Week	Lecture/Lab Topics	Assignments due Fri at 11:55 pm EST	Activities** due Fri at 11:55 pm EST	Test
Sept 8-11	(no lectures for Biol/Stat 2244)			
Sept 12-18	PPDAC: A scientific inquiry framework Sampling designs & considerations Lab 1: Getting to know R		<ul style="list-style-type: none"> • Core 1: Sampling • Reflection 1: Belonging 	
Sept 19-25	Sampling designs & considerations, continued Study designs & considerations Lab 2: Working with Data in R		<ul style="list-style-type: none"> • Application 1: Sampling 	
Sept 26-Oct 2	Study designs & considerations, continued Planning ahead: Sampling variability Lab 3: R script and R markdown files	Assignment 1: Problem and Plan		
Oct 3-9	Summarizing & Exploring Data		<ul style="list-style-type: none"> • R Practice 1: Working with RMD files (special deadline of 6 pm) 	
Oct 10-16	Oct 10: No section 001 lecture – Thanksgiving Probability Models & Vocabulary Probability Models: Binomial models Lab 4: Summarizing & Visualizing Data in R	Data Skills Project: Phase 1		
Oct 17-23	Probability Models: Normal models Sampling distributions Lab 5: Computing probability and percentiles		<ul style="list-style-type: none"> • Core 2: Sampling distributions • Reflection 2: Where are you? • Application 2: Data summaries 	
Oct 24-30	Understanding confidence intervals		<ul style="list-style-type: none"> • R Practice 2: Subsets, summaries, and probabilities 	Test: Frid, Oct. 28 at 7:00 pm
Oct 31-Nov 6	No classes (sections 001 & 002) - Fall Reading Week			
Nov 7-13	t confidence interval for the mean Large sample confidence interval for proportion Lab 6: t procedures for means in R	Assignment 2: Data	<ul style="list-style-type: none"> • Core 3: Exploring precision in confidence intervals 	

Nov 14-20	Understanding null hypothesis testing Large sample test for the proportion Lab 7: large sample procedures for proportions in R			
Nov 21-27	t test for the mean t confidence interval and test for difference in means Lab 8: two sample procedures in R		<ul style="list-style-type: none"> • Core 4: Exploring errors in hypothesis testing • R Practice 3: Review of skills 	
Nov 28-Dec 4	Large sample confidence interval and test for difference in proportions Simple linear regression Lab 9: Linear regression in R	Assignment 3: Analysis	<ul style="list-style-type: none"> • Reflection 3: Letter to students 	
Dec 5-9	One-factor ANOVA Lab 10: One-factor ANOVA in R	Data Skills Project: Phase 2 (special deadline of Thurs at 11:55 pm)	<ul style="list-style-type: none"> • Application 3: Inference (special deadline of Thurs at 11:55 pm) 	
Dec 10-22	Final Exam period (schedule posted the University Registrar on October 10th)			

****Not all Activities are required!** Review the description of the “Activities Increment” on page 9, and of Activities in general on page 11.

Course Materials

Required materials

These materials are “required” in that each student needs *access* to them to be successful in the course. Whether that access is individual, shared digitally by a group of individuals, or borrowed from the commons is up to you. In addition to these three main resources, we will occasionally use articles, videos, and applets available freely online to supplement your learning. ***If you discover any (open access) resources that are helpful to you for this course, I encourage you to share the details with the rest of the class!***



The OWL site (<http://owl.uwo.ca>, “STAT 2244A 001 FW22”) is used heavily; students are responsible for checking the site on a regular basis. It provides:

- Lecture and lab materials
- Assessment instructions and materials
- Practice questions
- Communication tools (Zoom, OWL Messages, Forums)
- Calendar of due dates and help sessions



The **Lab** component of the course requires using the statistical software program **R** and the integrated development environment, **R Studio**, to work with data and communicate. Both software packages are free to download to your personal computer (*best experience*) or for limited use through a browser (*if necessary*). Instructions for downloading/accessing R and R Studio is on the OWL site as part of Lab 1.

If you need assistance with OWL, please seek support on the [OWL Help page](#). Alternatively, contact the [Western Technology Services Helpdesk](#) (by phone at 519-661-3800 or ext. 83800). [Google Chrome](#) or [Mozilla Firefox](#) are the preferred browsers to optimally use OWL and our course materials. Ensure your browser is up-to-date.



If you are the type of student who finds having a textbook helpful, the recommended course textbook is: Baldi, B. and DS. Moore. 2018. ***The Practice of Statistics in the Life Sciences. 4th Ed.***, W.H. Freeman and Company. This book is available in an ebook on the platform “Achieve” (a limited term subscription, [cheapest through the UWO Bookstore](#)). **This textbook is NOT required; no readings from it will be assigned.**

Methods of Evaluation



This course uses a combination of more traditional grading schemes and **Specifications Grading**; the information provided below should be sufficient to understand how your grade will be calculated. However, if at ANY time you are uncertain on how your grade is determined, or what is required to earn credit for the course, **ask for clarification**. If you’re interested in learning more about “Specs Grading” in general, there’s a great blog post about it available [here](#).

Overview

Your course grade is determined through a combination of the **quality** and **quantity** of the work you submit. Your grade is composed of two (2) components:

1. Your **‘Base Grade’** (50%); the Base Grade is determined by your level of achievement on the Assignments, and your achievement on the Test and Final Exam. The Base Grade is an implementation of Specifications Grading.

2. Your **'Grade Increments'** which add additional percentage points onto your Base Grade using elements of a more traditional grading approach, based on your success on:
- the *Test* (10%)
 - the *Final Exam* (20%)
 - the *Improvement Bonus* (3%)
 - the *Data Skills Project* (7%)
 - the *Activities* (8%)

Determining your Base Grade

Your Base Grade is based on achievement on the set of three (3) *Assignments* in the course, and the *Test* and *Final Exam*. Each *Assignment* evaluates your mastery on a subset of the course-level learning outcomes (see page 4); your mastery of each course-level learning outcome is graded against a 4-level rubric using **M** = Mastery (highest level), **P** = Proficient, **A** = Approaching proficiency, **N** = Not met (lowest level). The number of **M**, **P**, **A**, and **N** levels you achieve (and hence, the number of learning outcomes for which you demonstrate some level of proficiency) is a major determinant of your Base Grade. This is combined with a minimum grade requirement for the *Test* and *Final Exam* incorporated into each Base Grade. Your final Base Grade will be based on the highest graded 'bundle' of accomplishments that you fulfill **in its entirety**.

To earn:	Achieve ALL of the following specifications:
52	<ul style="list-style-type: none"> • earn a grade of at least 90% on each of the <i>Test</i> and <i>Final Exam</i> • submit all 3 <i>Assignments</i> • earn level M across all <i>Assignment</i> learning outcomes
50	<ul style="list-style-type: none"> • earn a grade of at least 85% on <u>each</u> of the <i>Test</i> and <i>Final Exam</i> • submit all 3 <i>Assignments</i> • earn at least 8 level M and no level A or N across the <i>Assignment</i> learning outcomes.
45	<ul style="list-style-type: none"> • earn a grade of at least 80% on <u>each</u> of the <i>Test</i> and <i>Final Exam</i> • submit all 3 <i>Assignments</i> • earn at least 6 level M, no more than 1 level A, and no level N across the <i>Assignment</i> learning outcomes
40	<ul style="list-style-type: none"> • earn a grade of at least 70% on <u>each</u> of the <i>Test</i> and <i>Final Exam</i> • submit all 3 <i>Assignments</i> • earn at least 5 level P, no more than 2 level A and no level N across the <i>Assignment</i> learning outcomes
35	<ul style="list-style-type: none"> • earn a grade of at least 50% on the <i>Final Exam</i> • submit all 3 <i>Assignments</i> • earn at least 5 level P, no more than 3 level A and no more than 1 level N across the <i>Assignment</i> learning outcomes
30	<ul style="list-style-type: none"> • earn a grade of at least 40% on the <i>Final Exam</i> • submit all 3 <i>Assignments</i> • earn at least 5 level P and no more than 2 level N across the <i>Assignment</i> learning outcomes

Failing to meet the specifications for the 30 Base Grade will result in a *final course grade* of **40%** (or your actual computed grade, whichever is lower) being assigned, regardless of success on other graded components of the course. This means that the *minimum* that must be achieved to be eligible to earn credit (i.e. 'pass'/50%) in Biology/Statistics 2244 is the specifications for the 30 Base Grade. This defines the "Essential Requirements" for the course.

Determine your Grade Increments

Up to 43% could be added to the Base Grade earned, according to your achievement with the *Activities*, *Test*, *Final Exam*, and *Data Skills Project*.

Activities. The *Activities* can earn you up to 8% of your final course grade. The fraction of this 8% that you earn is based on which set of achievements you fulfill in their entirety:

To earn:	Achieve ALL of the following specifications:
8%	<ul style="list-style-type: none"> • earn credit for all four (4) Core Activities • earn credit for one (1) non-core Activity from each of the three categories: R practice, Reflection, and, Application • earn credit for at least one other Activity (from any of the categories)
7%	<ul style="list-style-type: none"> • submit all four (4) Core Activities, and earn credit for at least three (3) of them • earn credit for one (1) non-core Activity from each of the three categories: R practice, Reflection, and, Application • earn credit for at least one other Activity (from any of the categories)
5%	<ul style="list-style-type: none"> • submit at least three (3) of the Core Activities, and earn credit for at least two (2) of them • earn credit for one (1) R practice and (1) Application Activity
3%	<ul style="list-style-type: none"> • earn credit for any four (4) Activities of your choice (no restrictions on the type/category)

Failing to meet the specifications for the 3% *Activities Increment* will simply result in an *Activities Increment* of 0 out of the possible 8%. Note that there are no intermediate levels (for example, no possibility to obtain 6%).

Test. The *Test* is assigned 10% of your final course grade, in addition to its contribution to determining your Base Grade. For this *Test Increment*, you earn a fraction of the 10% according to the following formula:

$$\frac{\text{achieved points on Test}}{\text{total possible points for Test}} \times 10\%$$

Final Exam. The *Final Exam* is assigned 20% of your final course grade, in addition to its contribution to determining your Base Grade. For the *Final Exam Increment*, you earn a fraction of the 20% according to the following formula:

$$\frac{\text{achieved points on Exam}}{\text{total possible points for Exam}} \times 20\%$$

Improvement Bonus. The *Improvement Bonus* rewards achievement on the *Final Exam* that demonstrates improvement from your *Assignment* and *Test* achievements during the term. There are three (3) possible values for the *Improvement Bonus*:

If your <i>Final Exam</i> grade is consistent with the <i>Final Exam</i> requirement...	Amount of Bonus
for the Base Grade determined by your <i>Assignment</i> and <i>Test</i> achievements, but not consistent with any higher Base Grade	0%
for the Base Grade directly above the one determined by your <i>Assignment</i> and <i>Test</i> achievements, but no higher	1.5%
For any Base Grade that is at least two above the one determined by your <i>Assignment</i> and <i>Test</i> achievements	3%

For students whose *Assignment* and *Test* achievements result in a **52 Base Grade** (the highest Base Grade), a *Final Exam* grade that is higher than 90% but less than 95% will result in 1.5% *Improvement Bonus*, while a *Final Exam* grade that is 95% or higher will result in a 3% *Improvement Bonus*.

Examples of Improvement Bonus application: During the term, a student earned 72% on the *Test*, and had achievement on the *Assignment* learning outcomes that are consistent with the 40 Base Grade; consequently, their Base Grade entering the *Final Exam* is 40. If this student earns a *Final Exam* grade of:

- less than 80%, then their *Final Exam* grade would be consistent with the 40 Base Grade (or lower), and their *Improvement Bonus* would be 0%, because they have demonstrated work consistent (or lower) than that achieved throughout the term.
- 80% to less than 85%, then their *Final Exam* grade would be consistent with the 45 Base Grade—which is the Base Grade directly above the one determined by their *Assignment* and *Test* levels; their *Improvement Bonus* would be 1.5%.
- 85% or higher, then their *Final Exam* achievement would be consistent with either the 50 or 52 Base Grade—which is a Base Grade at least two above the one determined by their *Assignment* and *Test* achievements; their *Improvement Bonus* would be 3%.

Data Skills Project. Achievement on the *Data Skills Project* can earn you up to 7%. This *Increment* is computed as:

$$\frac{\text{achieved points for Phase 1} + \text{achieved points for Phase 2}}{\text{total possible points for Project}} \times 7\%$$

For example, if Phase 1 was graded out of 20 points, and you earned 15, and Phase 2 was graded out of 40 points, and you earned 35, then your *Data Skills Project Increment* will be:

$$\frac{15 + 35}{20 + 50} \times 7\% = 5.00\%$$

Assessment Descriptions

There are five (5) types of Assessment used in this course. Each will be described briefly in this section; more comprehensive details, including definitions of what is required to earn credit and grading rubrics/expectations will be provided on the OWL course site.

Assignments.

WHY? The *Assignments* are created to demonstrate your level of mastery on a subset of the course-learning outcomes (see **page 4** in this syllabus) in an authentic manner, including your use of the statistical software, R.

WHAT? There are three (3) *Assignments*, each composed of a couple short answer questions requiring written responses (possibly including graphs/tables and/or R code and output). The *Assignments* move progressively through the stages of the PPDAC framework³, and involve answering questions that relate to an overall research objective and set of related research questions. Each Assignment will address a subset of three (3) of the course-level learning outcomes; each learning outcome will be graded on a 4-level rubric, which will be provided in the *Assignment* instructions.

HOW? The majority of the *Assignments* will be submitted as an R markdown file (.RMD), and resulting knitted .PDF file⁴. Both files must be uploaded to the OWL “Assignments” tool, AND the .PDF version must be uploaded to Gradescope.ca.

ESSENTIAL REQUIREMENT. Completion ALL three (3) *Assignments* and earning at least 5 level P (and no more than 2 level N) on the *Assignment* learning outcomes is part of the ‘Essential Requirements’ to be eligible to earn credit (i.e. 50% or higher as a final course grade) for the course. Failing to meet the Essential Requirements with respect to *Assignments* will result in a final course grade recorded as 40% (or, your calculated course grade—whichever is lower).

³ Mackay, R.J., and R.W. Oldford. 2000. Scientific method, statistical method, and the speed of light. *Statistical Science* 15(3): 254-278.

⁴ You will learn about R markdown files and ‘knitting’ in one of the first Labs.

Activities.

WHY? The *Activities* are created to promote (i) active learning of important 'core' course concepts, (ii) engagement with the course material, (iii) self-reflection and metacognition, and/or (iv) practice of what you are learning.

WHAT? There are thirteen (13) *Activities* planned from which students can **choose a subset** to complete (which *Activities* and how many are chosen for completion depends on the grade you are working towards in the course). There are two main types of *Activities*: (i) 4 "Core" *Activities* which deal with important course concepts and require more work and critical thinking, and (ii) other non-core *Activities* (typically shorter). The Core *Activities* will be labeled as such. The non-core *Activities* are organized into 3 different classes (Reflection, R Practice, or Application) based on the type of exercise they involve. The *Activities* are graded on a credit vs. no-credit basis; the instructions file for each *Activity* will provide a list of "specifications" which are all required to earn credit for the *Activity*. If each of the specifications is met, credit will be awarded (this is communicated through the OWL "Gradebook" tool). If credit is *not* awarded for a particular class of non-core *Activity*, there may be opportunity to attempt another *Activity* of the same class to "replace" the unsuccessful attempt.

HOW? The method of completion and submission varies depending on the particular *Activity*. All *Activities* will have instructions provided through the OWL "Assignments" tool, and will have a submission to Gradescope.ca; most *Activities* will also require an additional submission to the OWL "Assignments" tool. The

Data Skills Project.

WHY? Introductory statistics courses should give students opportunity to work with real, multivariate data, and apply practical skills using statistical software. The *Data Skills Project* provides an opportunity for students to develop some research questions of interest to them, and visualize and analyse real data in R to answer those questions.

WHAT? You will create a file that includes information relevant to a metadata file⁵, and a series of research questions that can be answered by a previously collected dataset. Using the statistical software R, you will generate relevant graphs/summaries and conduct appropriate inference procedures to answer the research questions. There are two (2) points in the term where parts of the *Data Skills Project* will be due; these are referred to as 'Phases' for submission. Each Phase of the *Data Skills Project* will be graded using a traditional points-based system (e.g. $x / 20$ points achieved).

HOW? The *Data Skills Project* will be submitted as an R markdown file (.RMD) and knitted to a .PDF. Both files must be uploaded to the OWL "Assignments" tool, AND the knitted .PDF file must be uploaded to Gradescope.ca

Test.

WHY? The *Test* serves as a relatively low-weight opportunity to demonstrate your understanding, application, and integration of the course material from the first 'half' of the course, allowing assessment of your mastery of the course learning outcomes.

WHAT? One *Test* composed of a couple short answer and/or multiple choice questions, which may involve calculations, drawings, etc. Students may use non-programmable calculators (e.g. standard "scientific" calculators are permitted). A one-sided, 8.5" x 11" page of memory aids, formula, definitions, etc. may be brought to the *Test* (more details on this "One-Pager" will be provided in the *Test* information posted to OWL); the *Test* is "closed book" for all other resources. The *Test* will be graded using a traditional points-based system (e.g. $x / 20$ points achieved).

HOW? The *Test* will be conducted in-person, on paper, in a proctored location (details posted to OWL "Assignments" closer to the *Test* date).

⁵ You will be introduced to metadata in lecture and see examples in some R Practice *Activities*.

Final Exam.

WHY? The *Final Exam* serves as an opportunity to demonstrate your understanding, application, and integration of the course material, possibly including practical application of the skills/concepts related to the statistical software, R.

WHAT? A **cumulative** exam with several short answer questions and/or multiple choice questions, which may involve calculations, drawings, and data analysis/interpretation. Students may use non-programmable calculators (e.g. standard “scientific” calculators are permitted). A one-sided, 8.5” x 11” page of memory aids, formula, definitions, etc. may be brought to the Test (more details on this “One-Pager” will be provided in the *Test* information posted to OWL). The Exam is “closed book” for all other resources. The Exam will be graded using a traditional points-based system (e.g. $x / 20$ points achieved).

HOW? The *Final Exam* will be conducted in-person, on paper, in a proctored location during a pre-scheduled time period, as determined by the University Registrar. More details will be posted on OWL once the exam date, time, and location is determined.

ESSENTIAL REQUIREMENT. Earning a grade of 40% or higher on the *Final Exam* is an ‘Essential Requirement’ to be eligible to earn credit (i.e. 50% or higher as a final course grade) for the course. Failing to meet the Essential Requirements with respect to the Final Exam will result in a final course grade recorded as 40% (or, your calculated course grade—whichever is lower).

Accommodated Evaluations

All Assignment, Activity, and Data Skill Project deadlines have an automatic 48-h ‘grace period’. That is, if you cannot make the original deadline set (Fridays at 11:55 pm EST unless otherwise noted), you will have an additional 48-h period during which you can still submit the assessment **without** requiring any accommodation from Academic Counseling, or permission from the instructor. So, if you need some or all of that extra 48 hours to get these assessments submitted, simply take it—no questions asked. Beyond that 48-h grace period, late Activities *without* accommodation will not be accepted (as there is redundancy in the Activities, another later Activity could be completed instead). Late Assignments or Data Skills Projects will be accepted with a late penalty per 24 h or part thereof (the nature of the late penalty is described in the instructions for each Assignment or Data Skills Project). There is no limit on the number of assessments for which you ‘use’ the 48-h grace period.

Note that the 48-h grace period does NOT apply to the *Test* or the *Final Exam*.

To obtain accommodation for missed (or requests to submit work beyond the 48-h ‘grace period’, where applicable)) Assignments, Activities, Data Skills Project Phases, or Test, you must provide valid medical or supporting documentation to the Academic Counseling Office of your Faculty of Registration as soon as possible (for Faculty of Science students, see https://www.uwo.ca/sci/counselling/advising_services/index.html). 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.

How accommodation from Academic Counseling is handled depends on the assessment item being accommodated, as described below:

- An **Assignment** granted an extended deadline accommodation through Academic Counseling (i.e. beyond that described in the point above) should be discussed with your instructor via OWL Message as soon as possible to identify a suitable deadline. If the Assignment cannot be submitted prior to the date that the graded Assignment is returned to the rest of the class, then an INC will be issued for the course grade. The missed Assignment will be completed the next time the course is offered.
- **Non-core Activities** will not be accommodated except under the circumstance where it is the last opportunity for a student to earn credit for a particular class of non-core Activity. Otherwise, the student

missing the deadline for a non-core Activity can simply complete a different non-core Activity that is still available (i.e. with a deadline that has not yet passed). It behooves students to complete *Activities* throughout the course, rather than waiting until the last weeks in the course to submit non-core *Activities*.

- A **core Activity** granted an extended deadline accommodation through Academic Counseling should be discussed with your instructor via OWL Message as soon as possible to identify a suitable deadline. If the accommodation period extends beyond the point at which the graded core Activity is returned to the class, alternative arrangements will be made to fulfill the learning outcomes of the *core Activity*.
- There will be one make up **Test** for students who have obtained accommodation through Academic Counseling for missing the original *Test*. The make-up *Test* is **tentatively** scheduled for Tuesday, November 8th at 7:00 pm EST. Students who are scheduled to write the make up *Test*, but cannot due to conflict or other circumstances that are accommodated by Academic Counseling will have their *Test* grade assigned as the grade obtained on the *Final Exam* (this will then be used to determine their Base Grade and their *Test Increment*).

Note: missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement (e.g. Test or Final Exam) due to potential COVID-19 symptoms is **not** sufficient on its own.

Click [here](#) for a detailed and comprehensive set of policies and regulations concerning examinations and grading.

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 (politely) denied. Similarly, requests for alternative assessments or submission of revisions of assessments to increase marks will be (politely) denied.

Accommodation and Accessibility

Accommodation Policies

Students with disabilities work with 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 policy can be found at:

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

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>.

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup 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, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under [Special Examinations](#)).

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>).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Personal response devices (“clickers”) may be used in this course for the purpose of engagement during in-person learning and/or to provide informal feedback to your instructor about student understanding. Clicker use will not contribute to course grades. Any personal data collected (e.g. student usernames/identification and responses to clicker questions) will be treated like other confidential course-related data.

Tests and examinations in this course may be conducted using a remote proctoring service, in the event of a switch to 100% online delivery resulting from a COVID-19 resurgence. 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 device that meets 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>.

Professionalism & Privacy

Western students are expected to follow the [Student Code of Conduct](#). Additionally, the following expectations and professional conduct apply to this course:



- ✓ Students are expected to follow online etiquette expectations provided on OWL
- ✓ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared
- ✓ Recordings are not permitted (audio or video) without explicit permission
- ✓ Permitted recordings are not to be distributed
- ✓ Students will be expected to take an academic integrity pledge before some assessments

- ✓ All recorded sessions will remain within the course site or unlisted if streamed

Remote learning sessions for this course may be recorded.

Occasionally, your instructor may use remote learning technology (e.g. Zoom) for Student Hours (or in the event of a switch to 100% online delivery); these learning sessions may be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Copyright Statement

Please be aware that all course materials created by the instructor(s) are copyrighted and cannot be **sold/shared**. Those include materials used in tests/quizzes, assignments, midterms, activities, and finals. Any posting/sharing of such materials in part or whole without owner's consent is considered as violation of the Copyright Act and will be considered as a scholastic offence.

In addition, online services such as Chegg are actively monitored. Any questions that are coming out during midterms and finals and are posted to an online service will be searched. Such an activity will be considered as a scholastic offence and will result in academic penalty.

Support Services

Please visit the Science 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/>

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 (<http://www.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 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.

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