Western Science

# Department of Biology
***and***
# Department of Statistical and Actuarial Sciences
## Biology/Statistics 2244B – "Statistics for Science"

# Course outline for Winter 2021

THRIVE together

Although this academic year might be different, 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/.

## Technical Requirements

Stable internet connection

Laptop or computer

Working microphone (recommended)

## Important Dates

| Classes Start | Reading Week | Classes End | Study day(s) | Exam Period |
|---|---|---|---|---|
| January 11 | February 15 - 19 | April 12 | April 13 | April 14–30 |

March 15, 2021: Last day to drop a second-term half course or second-term full course without penalty

## Course Information

### Biology/Statistics 2244B, sections 001 and 002, FW2020

An introductory course in the application of statistical methods, intended for 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.

### List of Prerequisite(s)

A full (1.0) mathematics course, or equivalent, numbered 1000 or above. Statistical Sciences 1024A/B 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, Statistical Sciences 1024A/B): Economics 2122A/B, Economics 2222A/B, Geography 2210A/B, Health Sciences 3801A/B,MOS 2242A/B, Psychology 2810, 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, Statistical Sciences 2037A/B if taken prior to Fall 2010, former Psychology 2885 (Brescia), former Statistical Sciences 2122A/B, former Social Work 2205.

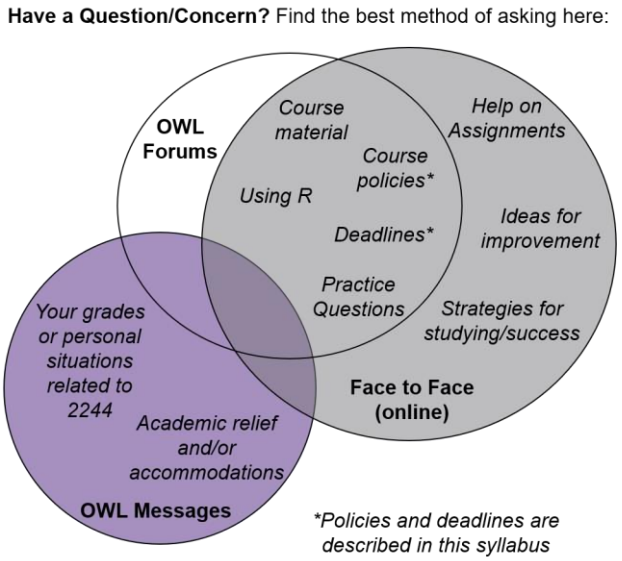
*Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped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

## Instructor Information

**Course Coordinator**
Jennifer Peter

**Contact Information**
Use *OWL Messages* to Jennifer Peter

My email address is too close to someone else's; using OWL Messages avoids lost/misdirected communications.




## Course Schedule and Delivery Mode

### Delivery of course material

| Component | Mode | Days/Times | Frequency |
|---|---|---|---|
| Lectures | Asynchronous online | n/a | weekly |
| Application sessions | Synchronous online | Wed/Fri: 12:30–1:30 pm<br>Tues/Thurs: 3:30–4:30 pm | see timetable |
| Assignment/R Help | Synchronous online | To be determined | weekly |
| Student Hours | Synchronous online | To be determined by poll | weekly |

The course material is taught through a combination of asynchronous, interactive lecture videos, short readings, and simulations. During scheduled weeks (see timetable below), there will be two types of ***optional*** synchronous online sessions:

(i) TA-facilitated "Assignment/R help" sessions during which you can ask questions about the Assignments and using the software, R. During some weeks, these sessions will occur during scheduled lab section periods, while in other weeks, the sessions will occur outside of the lab section period;

(ii) Instructor-facilitated "Application sessions" during which you can join small- and large-group activities that involve *applying* the course concepts that you are learning.

You are strongly encouraged to attend the "Application sessions", as they provide insight into the expectations related to the Assignments/Take Home Exam. In addition, the weekly 'Student Hours' will be times to 'drop in' to chat with your instructor about the course material, ask questions, etc. ***All synchronous components will be held via Zoom.***

| Lab Sections | |
|---|---|
| 003 | Tues, 6:30–9:30 pm |
| 004 | Tues, 6:30–9:30 pm |
| 005 | Wed, 6:30–9:30 pm |
| 006 | Wed, 6:30–9:30 pm |
| 007 | Wed, 6:30–9:30 pm |
| 008 | Thurs, 6:30–9:30 pm |
| 009 | Thurs, 6:30–9:30 pm |
| 010 | Thurs, 6:30–9:30 pm |
| 011 | Tues, 1:30–4:30 pm |
| 012 | Wed, 1:30–4:30 pm |
| 014 | Tues, 1:30–4:30 pm |
| 015 | Fri, 11:30 am–2:30 pm |

## Learning Outcomes

This course is meant to be both introductory and comprehensive, conceptual and practical. At a fundamental level, the course is organized to ***demonstrate that statistics is a scientific discipline that can and should inform research at all stages***, from problem definition to 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 (MacKay and Oldford 2000).

More specifically, by the end of the course, a successful student should be able to:

| | |
|---|---|
| Design sampling and study procedures to collect relevant data addressing a research question. | • Distinguish among common sampling and study designs.<br>• Identify issues associated with sampling and study design (e.g. bias, validity, confounding)<br>• Identify relevant inference procedures based on research question and variables. |
| Create and interpret appropriate summaries of data. | • Select summaries based on research question and variables.<br>• Interpret summaries to identify and/or describe patterns, trends, and interesting features in data. |
| Analyse data using inference procedures to address a research question. | • Select appropriate inference procedures for a research question.<br>• Interpret and describe confidence intervals and hypothesis test results.<br>• Evaluate the fit of models for common inference procedures.<br>• Identify situations and data that require alternative (i.e. not covered in this course) inference procedures. |
| Use statistical software to explore, summarize, analyse, interpret, and communicate data. | • Use R to create and modify graphical and numerical summaries of data.<br>• Use R to conduct common inference procedures, including evaluating conditions for model fit.<br>• Interpret R (including accompanying code) or other statistical software output correctly. |
| Communicate statistical concepts, analyses, and arguments in an accurate and scholarly manner. | • Apply vocabulary to describe statistical concepts, procedures, and ideas.<br>• Apply convential formats for reporting and interpreting results of statistical analyses in written/graphical form.<br>• Justify the choice of statistical procedures (e.g. selected study designs). |
| Describe models and/or conceptual background for common inference procedures. | • Describe the models for common inference procedures.<br>• Describe sampling distributions (based on simple random samples) for commonly used statistics.<br>• Discuss and describe issues associated with inference (e.g. power, precision, Type I/II errors). |

## Course timetable

The course material is best organized by ***topic*** rather than week, with the appropriate flow of topics illustrated in the table below. Some topics are larger than others such that students may find it best to let their review of a topic 'spill over' into the following week. Consequently, I have organized the 'timetable' below to accommodate for such 'spillage', particularly with buffer in the weeks of Jan 25, Feb 8, Mar 1, and Mar 29.

| Week | Topic | Application sessions (during lecture period) | Assignments/Projects (day/time to be voted upon) | Activities available |
|---|---|---|---|---|
| Jan 11–15 | PPDAC: A scientific inquiry framework<br>Sampling designs & considerations | Tues/Wed: Understanding 2244 | | January reflection<br>Sampling and selection bias (**core**)<br>Time map<br>Practice quiz<br>Application session participation<br>Muddiest point |
| Jan 18–22 | Study designs & considerations | Thurs/Fri: Planning a Sample | | |
| Jan 25–29 | Planning ahead: Sampling variability | | Assignment 1 due | |
| Feb 1–5 | Summarizing & Exploring Data | Tues/Wed: Planning a study | | February reflection<br>Sampling distributions (**core**)<br>Graphs summary<br>Practice quiz<br>R practice script<br>Application session participation<br>Muddiest Point |
| Feb 8–12 | Probability Models & Vocabulary | | Assignment 2 due | |
| ***Feb 15–19*** | ***Reading week*** | | | |
| Feb 22–26 | Probability Models: Normal models<br>Probability Models: Binomial models | Tues/Wed: Selecting summaries | | |
| Mar 1–5 | Sampling distributions | | Assignment 3 due<br>Group Project example due | March reflection<br>Confidence intervals (**core**)<br>Practice quiz<br>R practice script<br>Application session participation<br>Muddiest Point |
| Mar 8–12 | Understanding confidence intervals<br>t confidence interval for the mean | Thurs/Fri: Selecting models | | |
| Mar 15–19 | Large sample confidence interval for proportion<br>Understanding null hypothesis testing | | Assignment 4 due | |
| Mar 22–26 | Large sample test for the proportion<br>t test for the mean | | | |
| Mar 29–Apr 2 | t test for difference in means<br>Large sample test for difference in proportions | | Assignment 5 due | April reflection<br>Sampling distributions summary<br>Letter to next class<br>Practice quiz<br>R practice script<br>Application session participation<br>Muddiest Point |
| Apr 5–9 | Simple linear regression | Thurs/Fri: Selecting a procedure | | |
| Apr 12 | One-factor ANOVA | | Assignment 6 due<br>Group Project complete due | |
| Apr 14–30 | Final Exam period | | Take Home Exam | |

## 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, "Statistics 2244B 001 FW20") is used heavily; Students are responsible for checking the site on a regular basis. It provides:

- Lecture and lab materials
- Info on assigned readings
- Assignment instructions and materials
- Access to Activities and other graded components
- Practice questions
- Communication tools

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

Some course material will be delivered through assigned reading. The 'required' 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 hard copy or ebook on the platform "**SaplingPlus"** (a 6-month subscription, cheapest through the UWO Bookstore).
I will also attempt to find open access equivalents to most readings where possible.

*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.*

*If you need assistance with R, your instructor and TAs (during scheduled sessions) can help; there is also a WEALTH of online knowledge just a Google search away for R.*

*If you are using SaplingPlus and need help, their student support has historically been great: https://store.macmillanlearning.com/ca/content/get-help*

### Universal Design

This course has been designed using the Universal Design for Learning, which "focuses on eliminating barriers through initial designs that consider the needs of diverse people"[1]. As a consequence, you will encounter choice for many parts of the course. For example, some course material will be available in interactive video format as well as in text format—which format you choose to cover the material is up to you. Similarly, some assessments will offer a choice of topic or approach to build on your own personal interest. As well, diagnostic assessments (i.e. short quizzes that do not contribute to your grade) may be available at the start of some course topics to help you determine what you already know about the topic, so you can more efficiently allocate your time for learning the course material to achieve the learning outcomes. One major consequence of this design is that it will look like there is a lot to do for the course. Keep in mind, therefore, that some of the available content will be redundant and is available simply to support your preferred learning approach.

[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.

## Methods of Evaluation

This course uses a form of ***Specifications Grading***; there should be sufficient detail below (plus discussion at the start of the course) to understand how your grade will be calculated. However, if you're interested in learning more about this system in general, there's a great blog post about it available here.

### Overview

Your course grade is determined by the ***quality*** and ***quantity*** of the work you submit that is judged to be of an acceptable ('Satisfactory") level of quality. Your grade is composed of two (2) components:

1. Your ***'base grade'*** of 45% (F), 50% (D), 60% (C), 70% (B), or, 80% (A); the base grade is determined by which bundle of *Assignments* you choose to complete (and the success at which you complete them), satisfactory completion of the *Take Home Exam*, and satisfactorily completion of the *Group Project* (if applicable), and.
2. Your ***'grade increments'*** which add an increment onto your base grade as follows:
    - up to 9% for base grades of 50% or 60%
    - up to 20% for base grades of 70% or 80%.

    The total value of your Grade Increments is determined by the *Activities* you Satisfactorily complete, your achievement on the *Take Home Exam*, and, your achievement of the *Group Project* (if applicable).

The details of how the two components are graded are described below. An overview of the nature of the course assessments (i.e. what are Activities? What is involved in an Assignment?, etc.) is given on **page 8** of this syllabus. To help you keep track of your progress and potential course grade (because I know this grading scheme is different!), a checklist and organizational chart is available on the OWL site.

### Determine your Base Grade

To determine your base grade, look up your accomplishments in the following table:

| **To earn:** | **Accomplish ALL of the following:** |
|---|---|
| 80%<br>(A-level) | • Complete the "Triangle" bundle of Assignments and earn Satisfactory marks for **all 6** "Triangle" Assignments.<br>• Satisfactorily complete the Group Project.<br>• Complete the Take Home Exam and earn **at least 80%** on the Exam |
| 70%<br>(B-level) | • Complete 6 Assignments in total AND earn Satisfactory marks for (i) **at least 4** "Triangle" Assignments, AND, (ii) **1** additional Assignment at any level (Triangle, Square, or Circle). The 6th Assignment may be completed at any level and does not need to receive a Satisfactory mark (i.e. no revision/resubmission necessary).<br>• Satisfactorily complete the Group Project.<br>• Complete the Take Home Exam and earn **at least 75%** on the Exam |
| 60%<br>(C-level) | • Complete 6 Assignments in total AND earn Satisfactory marks for **at least 5** "Square" Assignments. The 6th Assignment may be completed at any level, and does not need to receive a Satisfactory mark (i.e. no revision/resubmission necessary).<br>• Complete the Take Home Exam and earn **at least 60%** on the Exam |
| 50%<br>(D-level) | • Complete 5 (or more) Assignments in total AND earn Satisfactory marks for **at least 4** "Circle" Assignments. The other Assignment(s) may be completed at any level (Triangle, Square, or Circle)), and does not need to receive Satisfactory marks (i.e. no revision/ resubmission necessary).<br>• Satisfactorily complete the Take Home Exam. |

***Note***: a grade of 45% (F) will be assigned if the requirements for the 50% (D-level) are not met, regardless of what is achieved for the 'Grade Increments' component.

The criteria (i.e. *specifications*) for Satisfactory marks/completion will always be described explicitly for each Assignment, the Group Project, and the Take Home Exam, and will be communicated to you in advance (i.e. on OWL).

Failing to meet the criterion for the Take Home Final exam associated with a base grade level will result in the final course grade being dropped by 5% from that base grade (assuming all other criteria for the base grade are met). For example, a student working towards a base grade of 60% who does not earn at least 60% on the Take Home Final exam will earn a base grade of 55% (to which their increment points will be added as normal).

Students working towards the 80% or 70% Base Grade level who do not complete the Group Project will have their Base Grade dropped to the 60% level (provided all other criteria for the 70% or 80% level are met and/or the criteria for the 60% level are met). Students working towards the 80% or 70% Base Grade level who complete the Group Project but fail to meet the requirements for Satisfactory completion of the Group Project will have their Base Grade dropped to the 60% (provided all other criteria for the 70% or 80% level are met and/or the criteria for the 60% level are met). These conditions apply equally to all students in the group for the Group Project.

## Determine your Grade Increments

Your Base Grade can be increased by up to 9% or 20% (depending on the Base Grade level) based on your achievement with the Activities, Take Home Exam, and Group Project (if applicable).

***Activities Increment.*** Your Satisfactory completion of Activities can earn you up to a 4% increase on your base grade, as described in the table below.

| **To earn:** | **Accomplish ALL of the following:** |
|---|---|
| 4% | • Satisfactorily complete **all 3** core Activities by their deadlines.<br>• Satisfactorily complete an additional **7** (or more) Activities by their deadlines. |
| 3% | • Satisfactorily complete **all 3** core Activities by their deadlines.<br>• Satisfactorily complete an additional **5 (or 6)** Activities by their deadlines. |
| 2% | • Satisfactorily complete **fewer than 3** core Activities by their deadlines AND Satisfactorily complete an additional **5** Activities by their deadlines,<br>**OR**,<br>• Satisfactorily complete **all 3** core Activities by their deadlines (and less than 5 additional Activities by their deadlines). |
| 1% | • Satisfactorily complete **fewer than 3** core Activities by their deadlines AND Satisfactorily complete an additional **1 to 4** Activities by their deadlines,<br>**OR,**<br>• Satisfactorily complete **2 of the 3** core Activities by their deadlines. |
| 0% | Awarded when the requirements at the 1% level are not met. |

The criteria (i.e. *specifications*) for Satisfactory completion will always be described explicitly for each Activity and will be communicated to you in advance (i.e. on OWL).

***Take Home Exam Increment.*** Your achievement on the Take Home Exam can earn you up to a 5% increase on your Base Grade. Remember that each Base Grade level has a minimal requirement for the Take Home Exam mark (e.g. Base Grade of 80% (A-level) requires a minimum of 80% on the Take Home Exam).

The Take Home Exam Increment rewards achievement *above* that minimal requirement by breaking the remaining available Exam marks into equally sized intervals. Since the remaining exam marks depends on the minimal requirement ("*base minimum*"), we use the following calculation to determine an interval size:

$$\text{"}interval\text{"} = \frac{100\% - (\text{"minimum"} + 1)}{5}$$

| To earn: | Accomplish ALL of the following: |
|---|---|
| 0% | Awarded when the exam grade is equal to the Base Grade minimum requirement. |
| 1% | • Meet the Base Grade minimum requirement for the Take Home Exam<br>• Achieve a Take Home Exam grade in the interval:<br>*base minimum* + 1 **≤ ACHIEVED GRADE <** *base minimum* + 1 + 1**interval* |
| 2% | • Meet the Base Grade minimum requirement for the Take Home Exam<br>• Achieve a Take Home Exam grade in the interval:<br>*base minimum* + 1 + *interval* **≤ ACHIEVED GRADE <** *base minimum* + 1 + 2**interval* |
| 3% | • Meet the Base Grade minimum requirement for the Take Home Exam<br>• Achieve a Take Home Exam grade in the interval:<br>*base minimum* + 1 + 2**interval* **≤ ACHIEVED GRADE <** *base minimum* + 1 + 3**interval* |
| 4% | • Meet the Base Grade minimum requirement for the Take Home Exam<br>• Achieve a Take Home Exam grade in the interval:<br>*base minimum* + 1 + 3**interval* **≤ ACHIEVED GRADE <** *base minimum* + 1 + 4**interval* |
| 5% | • Meet the Base Grade minimum requirement for the Take Home Exam<br>• Achieve a Take Home Exam grade in the interval:<br>*base minimum* + 1 + 4**interval* **≤ ACHIEVED GRADE ≤** 100% |

Remember (as described in the section on Base Grades), failing to meet the minimal requirement for the Take Home Exam described for a Base Grade level (while achieving all other Base Grade requirements) will result in 5% reduction from that Base Grade.

***Group Project Increment.*** Your group's achievement on the Group Project can earn you up to a 11% increase on your Base Grade, based on the following table. Note that only three categories of increase are possible. Remember that the Group Project, and therefore the Group Project Increment, are only available/relevant to students earning either a Base Grade of 70% or 80%.

| To earn: | Accomplish ALL of the following: |
|---|---|
| 11% | • Satisfactorily complete the Group Project.<br>• Earn an "Advanced" grade on the Group Project |
| 7% | • Satisfactorily complete the Group Project.<br>• Earn an "Intermediate" grade on the Group Project |
| 4% | • Satisfactorily complete the Group Project.<br>• Earn an "Novice" grade on the Group Project |
| 0 %- | Awarded if the Group Project is Satisfactorily completed but does not meet the standard for a Novice grade. |

The criteria (i.e. *specifications*) for Satisfactory completion and a rubric detailing the grade levels (i.e. Novice, Intermediate, Advanced) will be described explicitly for the Group Project and will be communicated to you in advance (i.e. on OWL).

## Assessment Descriptions

There are four (4) types of Assessment used in this course. Each will be described briefly in this section; more comprehensive details, including definitions of Satisfactory completion and grading rubrics/expectations will be provided on the OWL course site.

### *Assignments.*

**WHY?** The Assignments are created to evaluate your mastery on the learning outcomes (see **page 3** in this syllabus) in an authentic manner, including your use of the statistical software, R.

**WHAT?** There are six (6) Assignments, each composed of (typically) 1–2 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 framework[2], and involve answering questions that relate to an overall research objective and set of related research questions. For each of the six (6) Assignments, there will be three (3) different types, "Triangle", "Square", and "Circle"; these types differ in the complexity and depth at which course material and learning outcomes are assessed.

**HOW?** Assignments will be submitted as an R markdown file (.rmd) and knitted to a .PDF output (don't worry! We'll talk about .rmd files and knitting at the start of the course!). Both files must be uploaded to the OWL "Assignments" tool, AND the .PDF output file must be uploaded to Gradescope.

**ESSENTIAL REQUIREMENT.** Satisfactory completion of the Assignments is an 'Essential Requirement' to be eligible to earn credit (i.e. 50% or higher as a final course grade) for the course. The number of Assignments and type of Assignment (Triangle, Square, Circle) required to fulfill this Essential Requirement is described in the requirements for the Base Grade in the section above. Failing to meet the requirements for the Essential Requirement will result in a final course grade recorded as 45% (or, your calculated course grade—whichever is lower).

### *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) summarization/practice of what you are learning.

**WHAT?** There are at least twenty-six (26) Activities available from which students can choose a subset to complete (which Activities and how many are chosen for completion depends on the Activity Grade Increment you are working towards). There are two types of Activities: (i) 3 "core" Activities which deal with important course concepts and are a little more involved, and (ii) many other, normal, Activities (typically shorter, or less challenging).

**HOW?** The method of Satisfactory completion and submission varies depending on the particular Activity. There are, however, three main submission methods that will be used: (i) uploading to OWL "Assignments" tool and Gradescope, (ii) as a 'quiz' through OWL "Tests and Quizzes" tool, or, (iii) through participation during synchronous Application Sessions on Zoom. The proper submission method and requirements for Satisfactory completion will be detailed on OWL alongside the description of each Activity.

### *Group Project.*

**WHY?** The content of this course is meant to be practical and ideally useful for your future courses, research, and/or jobs. One of the more valuable skills you should finish the course with is proficiency in using the statistical software, R. The Group Project provides a collaborative opportunity to bring together practical skills in R and the 'conceptual' course material. Creating the Group Project will also serve as a method of reviewing/studying the course material, and, ideally, will result in a reference manual that may be useful for the Take Home Exam, and, after the course has finished.

**WHAT?** As a small group (i.e. 4 students) who are working towards either the 80% or 70% Base Grade, you will create a document that summarizes how to use the statistical software R to apply techniques (e.g. graphs, inference procedures, etc.) taught in the course. An opportunity to submit a piece of the Group Project (an 'example')part way through the term will be available so students can receive feedback and comments for improvement in advance of completing the Project for final submission. Note that students working towards the 60% or 50% Base Grade are not required to complete the Group Project.

**HOW?** The Group Project will be submitted as an R markdown file (.rmd) and knitted to a .PDF output (don't worry! We'll talk about .rmd files and knitting at the start of the course!). Both files, plus any accompanying dataset, must be uploaded to the OWL "Assignments" tool, AND the .PDF output file must be uploaded to Gradescope.

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

### *Take Home Exam.*

**WHY?** The Take Home Exam serves as an opportunity to evaluate your understanding, application, and integration of the course material, including practical application of the skills/concepts with the statistical software, R.

**WHAT?** An exam with several short answer questions involving written responses as well as data analysis using R. The exam will be set with the expectation that a *prepared* student could complete the entire exam in 3-5 hours. You will, of course, be given a larger window of time to complete the exam (e.g. to accommodate differences in time zones).

**HOW?** The Take Home Exam will be submitted as an R markdown file (.rmd) and knitted to a .PDF output (don't worry! We'll talk about .rmd files and knitting at the start of the course!). Both files must be uploaded to the OWL "Assignments" tool, AND the .PDF output file must be uploaded to Gradescope.

**ESSENTIAL REQUIREMENT.** Satisfactory completion of the Take Home 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 requirements for this Essential Requirement will result in a final course grade recorded as 45% (or, your calculated course grade—whichever is lower).

## Accommodated Evaluations

There are two methods to obtain accommodations (e.g. handling missed work or requiring deadline extensions) in this course: (i) a Token system, and (ii) through Academic Counselling (i.e. submitting relevant documentation to an Academic Counsellor, or, using a Self-Reported Absence). How accommodations are handled through each method is described below

### *The Token System*

At the start of the course, each student has two (2) virtual 'Tokens'. Each token is valued as one of the following:

- An opportunity to revise and resubmit an Assignment ***within one week*** of receiving an Unsatisfactory grade on the Assignment. The resubmission must be from the same bundle (i.e. Triangle, Square, or Circle) as the original submission. No revision/resubmission is possible for Activities or the Group Project.
- A 24-hour extension to the deadline for an Assignment, Activity, or the Group Project.

You can use your two Tokens at any point during the term (in keeping with the time constraints described above) and in any combination (i.e., you could use both as 24-h extensions, or both as revision opportunities, or a mix of both). Tokens are 'redeemed' through OWL via the "Tests & Quizzes" tool.

Notice that Tokens **cannot** be used for the Take Home Exam or for any purpose other than the two listed above. Tokens are non-transferable (i.e. you cannot 'gift' an unused Token to another student).

### *Accommodation through Academic Counselling*

All assessments (*Assignments, Group Project,* and *Activities*) can be considered as worth less than 30% of the course grade, and therefore are 'eligible' for accommodation via a Self-Reported Absence. The following situations apply when using a Self-Reported Absence and/or when Accommodation has been obtained from an Academic Counselor:

- Late assessments (*Assignments, Group Project*, or *Activity*) should be submitted within 24 hours of the submission of the last illness Self-Report for that assessment.
- An *Assignment* granted an extended deadline accommodation (i.e. beyond that described in the point above) can be submitted up until the time that the Assignment has been returned to the class. If the Assignment accommodation period extends even beyond that timeframe, AND, its absence would change the Base Grade, then an INC will be issued. The missed Assignment will be completed the next time the course is offered.
- When a group member has been granted an extended deadline accommodation (i.e. beyond that of a Self-Reported Absence) for the *Group Project*, the Group Project should be submitted 'as is' (i.e. without

the accommodated student's contributions) by the original deadline. The accommodated student's contributions to the Group Project can be added later, up until the Group Projects have been graded and returned to the rest of the class. If the accommodation period extends even beyond that timeframe, then an INC will be issued. The Group Project will be completed the next term the course is offered.

Note that missed Activities are not accommodated; a student with accommodation for an Activity deadline can simply complete a different Activity that is still available (i.e. with a deadline that has not yet passed). It behooves students to complete Activities throughout the term, rather than waiting until April to submit the Activities needed for their desired Activities Grade Increment.

Late assessments (*Assignments*, *Group Project*, *Activities*, or *Take Home Exam*) *without* accommodation will not be accepted (unless a Token is redeemed where applicable, as described above); similarly, missed assessments will not be accommodated except as described above. Academic accommodation cannot excuse or change the status of an Unsatisfactory grade for an assessment; only a Token can create an opportunity for revision and resubmission (as described above).

***Accommodation for the Take Home Exam.*** Accommodation granted for the time period of the Take Home Exam enables the student to write a make-up Take Home Exam (i.e. a special exam, "SPC"). One make-up Take Home Exam will be scheduled shortly after the official exam period. Students who are unable to write that make up (with additional accommodation) will write the final exam in the next term that the course is offered. Accommodation for the Take Home Exam cannot result in an extension to the original exam deadline.

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.

## Accommodation and Accessibility

### Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf

### Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,

- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For policy on Academic Consideration for Student Absences-Undergraduate Students in First Entry Programs, see:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf
and for the Student Medical Certificate (SMC), see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

### Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:
https://multiculturalcalendar.com/ecal/index.php?s=c-univwo

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

[optional] 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 Academic Calendar for details (under Special Examinations).

## Academic Policies

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

In accordance with policy, http://www.uwo.ca/its/identity/activatenonstudent.html, 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 his/her official university address is attended to in a timely manner.

### 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, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) 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.

## Some of the remote learning sessions for this course 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.

***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.

## 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

## 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, 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 add/drop 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 Student Accessibility Services (SAS) at (519) 661-2147 if you have any questions regarding accommodations.

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/

Learning-skills counsellors at the Student Development Centre (http://www.sdc.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.

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

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