

<b>Course ID:</b>	<b>Course Title:</b>	<b>Winter 2024</b>
<b>BIO 310</b>	<b>Quantitative Methods for the Biological Sciences</b>	<b>Prerequisite: Math 30</b>
		<b>Credits: 3</b>

Class Information		Instructor Information		Important Dates	
<b>Delivery:</b>	In Class	<b>Instructor:</b>	John Wiest, M.Sc.	<b>First Day of Class:</b>	January 10, 2024
<b>Day(s):</b>	Wed/Fri	<b>Email:</b>	<a href="mailto:jwiest@ambrose.edu">jwiest@ambrose.edu</a>	<b>Last Day to Add/Drop:</b>	January 21, 2024
<b>Time:</b>	9:45AM – 11:00AM	<b>Phone:</b>	(403)410-6915	<b>Last Day to Withdraw:</b>	March 28, 2024
<b>Room:</b>	L2084	<b>Office:</b>	L2115	<b>Last Day to Apply for Coursework Extension:</b>	April 2, 2024
<b>Lab/Tutorial:</b>	Mon 10:00AM -11:00AM, L2100	<b>Office Hours:</b>	Wednesdays 1:00PM – 4:00PM, or by drop in	<b>Last Day of Class:</b>	April 12, 2024
<b>Final Exam:</b>	Wed., April 17, 9:00AM – 12:00PM, L2084				

### Important Dates and Information

For a list of all important dates and information regarding participating in classes at Ambrose University, please refer to the Academic Calendar at <https://ambrose.edu/academic-calendar>.

**Written Assignment 1 DUE: Feb 26**

**Midterm Exam : March 8**

**Written Assignment 2 DUE: Apr 5**

### Course Description

This course is designed to give students a basic understanding of descriptive and inferential statistics. Emphasis is placed on practical application and students will learn to analyze and interpret basic statistical research. Topics include collection and presentation of data, descriptive statistics, introduction to probability theory, estimation, hypothesis testing, correlation and linear regression, and experiment design. Students will also learn how to use computer software to analyze data.

### Expected Learning Outcomes

- Demonstrate an understanding of what “statistics” is

- Analyze the advantages and drawbacks of different methods of viewing and describing data
- Choose the appropriate statistical technique based on a given situation
- Understand how probability, probability distributions, and hypothesis testing are used in statistics
- Interpret the results of statistical analyses, draw conclusions, and describe solutions
- Learn the basics of the statistical computing software package R, and how to obtain statistical results from it.

## Textbooks

Navidi, W. (2021). *Principles of Statistics for Engineers and Scientists* (2nd ed.). New York: McGraw-Hill.

ISBN13: 978-1-260-25781-6

## Course Schedule

### Part 1: Descriptive Statistics (2-3 Weeks)

- Data in all its forms
  - Key terminology, Definitions of Statistics
  - Levels of Measurement
  - Data, sampling, and variation
  - Frequency and Frequency Tables
- Graphical Techniques
  - Stem-and-Leaf Graphs, Line Graphs, Bar Graphs
  - Histograms, Frequency Polygons
  - Box Plots
- Numerical Methods
  - Describing Central Tendency
  - Measures of Variation
  - Percentiles, Quartiles, and Whiskers Displays

### Part 2: Probability & Probability Distributions (3-weeks)

- The Concept of Probability
  - Sample Spaces and Events
  - Some Elementary Probability Rules
  - Conditional probability and Independence
- Discrete Random Variables
  - Two Types of Random Variables
  - Discrete Probability Distributions
  - Binomial Distributions
  - Poisson Distributions
- Continuous Probability Distributions
  - The Uniform Distribution
  - The Normal Probability Distribution
- Sampling & Sampling Distributions
  - Random Sampling
  - The Sampling Distribution of the Sample Mean
  - The Sampling Distribution of the Sample Proportion
  - Surveys and Errors in Survey Sampling

### Part 3: Confidence Intervals & Hypothesis Testing (4-5 weeks)

- Confidence Intervals
  - z-Based Confidence Intervals
  - t- Based Confidence Intervals
  - Sample Size Determination
  - Confidence Intervals for a Population Proportion
- Hypothesis Testing
  - The Null and Alternative Hypotheses
  - Errors in Hypothesis Testing
  - z-Test about a Population Mean
  - t- Test about a Population Mean
  - z-Test about a Population Proportion

**Part 4: Statistical Inferences Methods (2-3 weeks)**

- Statistical Inferences Based on Two Samples
  - Comparing Two Population Means
  - Paired Difference Experiments
  - Comparing Two Population Proportions
  - The F-Distribution and One-way Independent ANOVA
- Chi-Square Tests
  - Chi-Square Distribution
  - Chi-Square Goodness-of-Fit Tests
  - A Chi-Square Test of Independence
- Correlation and Regression
  - Correlation Coefficients
  - Significance testing for a correlation coefficient
  - The Regression equation

**Requirements:**

All students should have, at minimum, a calculator capable of performing statistical functions (i.e. able to input a data set and compute mean, standard deviation, etc.). You will also require a laptop on which you can download the open-source statistical software package R. We will be learning the basics of how to use this software and how to make it do some fun things for us statistically.

**Attendance:**

I will not be taking attendance in class; however, it is **strongly** suggested you attend classes. Materials will be covered in class that are not in the textbook and that will be potentially explored in a different manner than you might find from a YouTube search or on some website. My grading will be based on how we cover things IN CLASS, so if you decide to not attend and then hope you can teach yourself later you will risk doing things incorrectly. Our lab time will be where we explore how to use the R software (as well as explore further topics from class); it is strongly suggested you come to labs to make sure you have appropriate support.

**Grade Summary:**

Online Assignments:	26%
Written Assignments:	24%
Midterm Exam:	20%
Final Exam:	30%

- There will be an online assignment every week, unless there is a handwritten assignment due. Access to the online assignments will be through course Connect page. Students will need to purchase access to these online assignments (which will be done through the Connect web page). Details on the specific course section and how to access this will be on the course moodle page. If you do not purchase this access, you will not be able to complete the Online Assignments.
- The Written Assignments will be posted to the course Moodle page. These assignments will invite you to engage with the open-source statistical software package **R**. R is the preferred statistical software of the sciences these days for its versatility, its ability to collaborate, as well as its ability to be modified at need, but it does require some fairly intensive front end learning to start getting your head wrapped around it. Most of our R exploring will happen in tutorial time, so please don't consider this an optional situation.
- The Midterm and Final Exams will be in person. During these exams you will be allowed
  - Your calculator
  - A set of notes that you create to bring into the exam
  - A pencil

If you need any special exam accommodations, please contact learning services in the Ambrose Student Centre as soon as possible to discuss this with them.

The available letters for course grades are as follows:

Grade	Interpretation	Percentage	Grade Points
A+	Excellent	95 to 100	4.00
A		90 to 94	4.00
A-		85 to 89	3.70
B+	Good	80 to 84	3.30
B		76 to 79	3.00
B-		72 to 75	2.70
C+	Satisfactory	68 to 71	2.30
C		64 to 67	2.00
C-		60 to 63	1.70
D+	Poor	55 to 59	1.30
D	Minimal Pass	50 to 54	1.0
F	Failure	0 to 49	0.00
P	Pass		No Grade Points

Because of the nature of the Alpha 4.00 system, there can be no uniform University-wide conversion scale. The relationship between raw scores (e.g. percentages) and the resultant letter grade will depend on the nature of the course and the instructor's assessment of the level of each class, compared to similar classes taught previously.

Please note that final grades will be available on student registration system. Printed grade sheets are not mailed out.

**Other:**

Math is best learned in a participatory manner. Please come to class prepared to engage with the materials, the instructor, and your classmates. The hope is that our return to in-person learning will allow greater engagement with the concepts at play, but it is still up to you to ask questions when you're confused, try out new techniques and explore new ideas, and generally be an active learner.

## Ambrose University Important Information:

### Communication

All students have received an Ambrose e-mail account upon registration. It is the student's responsibility to check this account regularly as the Ambrose email system will be the professor's instrument for notifying students of important matters (cancelled class sessions, extensions, requested appointments, etc.) between class sessions.

### Exam Scheduling

Students who find a conflict in their exam schedule must submit a *Revised Final Exam Time Application* to the Office of the Registrar by the deadline noted in the Academic Calendar. Requests will be considered for the following reasons only: 1) the scheduled final examination slot conflicts with another exam; or 2) the scheduled final examination slot results in three consecutive examination periods. Travel is not considered a valid excuse for re-scheduling or missing a final exam.

### Standards of Behaviour in the Classroom Setting

Learning is an active and interactive process, a joint venture between student and instructor and between student and student. Some topics covered within a class may lead to strong reactions and opinions. It is important that Students understand that they are entitled to hold contradictory beliefs and that they should be encouraged to engage with these topics in a critical manner. Committing to this type of "active learning" significantly increases the learning experience for both teacher and student, and reflects the Christian imperative to pursue truth, which lies at the heart of the Ambrose educational experience. However, active discussion of controversial topics will be undertaken with respect and empathy, which are the foundations of civil discourse in the Classroom Setting. Primary responsibility for managing the classroom rests with the instructor. The instructor may direct a student to leave the class if the student engages in any behaviour that disrupts the classroom setting. If necessary, Ambrose security will be contacted to escort the student from class. Please refer to your professor regarding their electronic etiquette expectations.

### Academic Integrity

We are committed to fostering personal integrity and will not overlook breaches of integrity such as plagiarism and cheating. Academic dishonesty is taken seriously at Ambrose University as it undermines our academic standards and affects the integrity of each member of our learning community. Any attempt to obtain credit for academic work through fraudulent, deceptive, or dishonest means is academic dishonesty. Plagiarism involves presenting someone else's ideas, words, or work as one's own. Plagiarism is fraud and theft, but plagiarism can also occur by accident when a student fails or forgets to acknowledge to another person's ideas or words. Plagiarism and cheating can result in a failing grade for an assignment, for the course, or immediate dismissal from the university. Students are expected to be familiar with the policies in the current Academic Calendar that deal with plagiarism, cheating, and the penalties and procedures for dealing with these matters. All cases of academic dishonesty are

reported to the Academic Dean and become part of the student's permanent record.

### Academic Policies

It is the responsibility of all students to become familiar with and adhere to academic policies as stated in the Academic Calendar. The academic calendar can be found at <https://ambrose.edu/academics/academic-calendar>

### Privacy

Personal information (information about an individual that may be used to identify that individual) may be required as part of taking this class. Any information collected will only be used and disclosed for the purpose for which the collection was intended. For further information contact the Privacy Compliance Officer at [privacy@ambrose.edu](mailto:privacy@ambrose.edu).

### Coursework Extensions

Should a request for a time extension on coursework exceed the end of the term, a *Coursework Extension Application* must be completed and submitted to the Office of the Registrar. The extension (if granted) will be recorded on the student record. Extensions are granted at the discretion of the instructor and registrar. Normally, Course Extension Applications will be considered only when all of the following conditions are met:

- the quality of prior course work has been satisfactory;
- circumstances beyond your control, such as an extended illness or death of a family member, make it impossible for you to complete the course work on time; and
- you submit *Coursework Extension Application* to the Office of the Registrar on or before the deadline specified in the Academic Schedule.

If granted, time extensions do not excuse you from a final examination where one has been scheduled for the course. A temporary grade of TX will be assigned until a final grade is submitted in accordance with the new deadline. A final grade of F will apply to:

- all course work submitted after the end of the semester unless a coursework extension has been granted; and all course work submitted after the revised due date provided by an approved extension to coursework.

## Academic Success and Supports

### Accessibility Services

Academic accommodation is provided to Ambrose students with disabilities in accordance with the Alberta Human Rights Act and the Canadian Charter of Rights and Freedoms. Provision of academic accommodation does not lower the academic standards of the university nor remove the need for evaluation and the need to meet essential learning outcomes. Reasonable accommodations are tailored to the individual student, are flexible, and are determined by considering the barriers within the unique environment of a postsecondary institution. It can take time to organize academic

accommodations and funding for disability-related services. Students with a disability who wish to have an academic accommodation are encouraged to contact Accessibility Services as early as possible to ensure appropriate planning for any needs that may include accommodations. Staff can then meet with students to determine areas to facilitate success, and if accommodations are required, ensure those accommodations are put in place by working with faculty.

### **Ambrose Writing Services**

Ambrose Writing services provides academic support in the four foundational literacy skills—listening, speaking, reading, and writing. It also assists students with critical thinking and the research process. Throughout the academic year, students can meet with a writing tutor for personalized support, or they can attend a variety of workshops offered by Academic Success. These services are free to students enrolled at Ambrose University. Academic Success serves all students in all disciplines and at all levels, from history to biology and from theatre to theology. To learn more, please visit <https://ambrose.edu/sas/writing-services>

### **Ambrose Tutoring Services**

Ambrose Tutoring Services provides support in specific disciplinary knowledge, especially in high-demand areas such as chemistry, philosophy, math and statistics, and religious studies. These tutors also coach students in general study skills, including listening and note-taking. During the academic year, Ambrose Tutoring Services offers drop-in tutoring for courses with high demand; for other courses, students can book a one-to-one appointment with a tutor in their discipline. These services are free to students enrolled at Ambrose University. To learn more, please visit <https://ambrose.edu/tutoring>.

### **Mental Health Support**

All of us need a support system. We encourage students to build mental health supports and to reach out when help is needed.

#### On Campus:

- Counselling Services: [ambrose.edu/counselling](https://ambrose.edu/counselling)
- Peer Supportive Listening: One-to-one support in Student Life office. Hours posted at [ambrose.edu/wellness](https://ambrose.edu/wellness).
- For immediate crisis support, there are staff on campus who are trained in Suicide Intervention and Mental Health First Aid. See <https://ambrose.edu/student-life/crisissupport> for a list of staff members.

#### Off Campus:

- Distress Centre - 403-266-4357
- Sheldon Chumir Health Care Centre - 403-955-6200
- Emergency - 911

### **Sexual Violence Support**

All staff, faculty, and Residence student leaders have received *Sexual Violence Response to Disclosure* training. We will support you and help you find the resources you need. There is a website with on and off campus supports – [ambrose.edu/sexual-violence-response-and-awareness](https://ambrose.edu/sexual-violence-response-and-awareness).

#### Off Campus:

- Clinic: Sheldon Chumir Health Centre - 403-955-6200
- Calgary Communities Against Sexual Abuse - 403-237-5888

**Note:** Students are strongly advised to retain this syllabus for their records.