



School of Science
RRMT 202
Statistics for Biological Sciences
Winter 2023
3 Credits

Course Outline

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OFFICE HOURS: Mon / Wed 9:30 -10:30 or by email appointment

LECTURE: Mon / Wed 10:30 - noon **Room:** A2103 **Dates:** Jan. 4 – April 12

LAB: Friday 10:00 - noon **Room:** A2702 **Dates:** Jan. 6 – April 13

COURSE DESCRIPTION

This course is designed as an introductory course for students preparing for a career in any area of field biology. Graduates will likely confront the problem of describing and interpreting information drawn from natural systems early in their careers. This course is designed to assist students in three ways. First, we will survey some of the descriptive statistical techniques used to describe variation. Secondly, we introduce some of the ways statistics can be used to test hypotheses. Finally, students will take steps towards developing their statistical “literacy” by reading sections from technical reports and learning how to interpret the statistics that are presented.

We will adopt a practical approach in this course and many of the key concepts will be introduced by using data drawn from real field situations. We will emphasize the use of computer programs to carry out calculations and the tutorials will include “hands-on” exercises and activities using actual field data

PREREQUISITES

Enrolment in Renewable Resource Management Program or permission of the instructor; working knowledge of spreadsheet software (e.g. Excel) is highly recommended.

RELATED COURSE REQUIREMENTS

Lectures and tutorial activities during Winter 2023 are planned as face-to-face classes. Students will need access to spreadsheet software to complete tutorial assignments.

EQUIVALENCY OR TRANSFERABILITY

Receiving institutions determine course transferability. Find further information at:

<https://www.yukonu.ca/admissions/transfer-credit>

LEARNING OUTCOMES

Students who successfully complete this course will be able to:

- Understand how statistics can be used to describe the range of variation in biological systems.
- Analyze a set of raw data and describe it using graphs, such as frequency distributions as well as

descriptive statistics.

- Use spreadsheets to carry out simple statistical analyses including correlation and linear regression.
- Use inferential statistics to compare means of two populations.
- Present statistics in a formal scientific report that includes appropriate reporting of descriptive and inferential statistics (e.g. t –test).

COURSE FORMAT

Lectures: Three hours per week (2 classes of 1.5 hours, face-to-face). If technically possible, a video recording of the classroom lectures will be made available online after class but students should participate in each class rather than relying on an uncertain video archive. Many students will find they spend an hour per lecture outside of class time reading the text and reviewing notes.

Tutorials: Two hours per week held in the computer lab. There will be weekly problem sets to work through for each tutorial and students will be expected to use computer spreadsheets for many analyses. There may be one data collecting exercise in February, on snowshoes, to collect snow depths so we can compare two contrasting areas along McIntyre Creek. Some students may spend up to four hours outside of class time working on the weekly tutorial problem sets.

Lectures on Feb. 15 & 27 and the tutorial on Feb. 17 may need to be re-scheduled to accommodate conflicts with the RRMT 204 field course to Peru.

ASSESSMENTS:

Attendance & Participation

Students are expected to attend both lectures and the scheduled tutorials. There is a strong correlation between regular attendance and academic performance.

Assignments

Each tutorial will focus on a different skill set and students will be required to submit answers to the weekly problem sets introduced during the tutorial.

Tests

Rather than a single mid-term examination we will have two shorter quizzes. The final exam is scheduled for Friday April 14 at 1 PM. The open book exam will be comprehensive and cover all topics taken up during the term.

EVALUATION:

Tutorial assignments	40%
Midterm exams (2 @15% each)	30%
Final Exam	30%
Total	100%

REQUIRED TEXTBOOKS AND MATERIAL

Fowler, J. and L. Cohen, Practical Statistics for Field Biology. 1998. 2nd Ed.

ACADEMIC INTEGRITY

Students are expected to contribute toward a positive and supportive environment and are required to conduct themselves in a responsible manner. Academic misconduct includes all forms of academic dishonesty such as cheating, plagiarism, fabrication, fraud, deceit, using the work of others without their permission, aiding other students in committing academic offences, misrepresenting academic assignments prepared by others as one's own, or any other forms of academic dishonesty including falsification of any information on any Yukon University document. Please refer to Academic Regulations & Procedures for further details about academic standing and student rights and responsibilities

ACCESSIBILITY AND ACADEMIC ACCOMMODATION

Yukon University is committed to providing a positive, supportive, and barrier-free academic environment for all its students. Students experiencing barriers to full participation due to a visible or hidden disability (including hearing, vision, mobility, learning disability, mental health, chronic or temporary medical condition), should contact Accessibility Services for resources or to arrange academic accommodations: access@yukonu.ca.

Lecture Topic Outline and Schedule – *December 19 version*

Mon	Lecture Topic	Wed	Lecture Topic	Fri	Tutorial Topic
		04-Jan	Chap. 1 & 2: statistics, observations, measurement scales: nominal, ordinal, interval & ratio, coefficient of variation, descriptive & inferential statistics, discrete & continuous variables, precision, accuracy	06-Jan	Tutorial #1: Using Excel to prepare descriptive statistics
09-Jan	Chap. 5 & 6: populations versus samples, measures of central tendency: mean, median, mode, measures of dispersion: range, standard deviation, variance, sum of squares, degrees of freedom	11-Jan	Chap. 3 & 4: frequency distribution, frequency table, outliers, bar graph, histogram, implied class limits, class interval, class mark. Intro to probability, types of probability dist'ns: Poisson, binomial, negative binomial	13-Jan	Tutorial #2: Plotting freq dist'ns and using the Histogram feature in Excel
16-Jan	Normal Dist'n - Chap. 9: types of distributions, z-scores, standardizing a normal curve, z-table, one and two-tailed regions, level of significance. Overview of t dist'n and when to use.	18-Jan		20-Jan	Tutorial #3: Working with normal curves
23-Jan	Confidence limits - Chap. 11: sampling distribution, standard error, Central Limit theorem, confidence limits, t-table	25-Jan	Plotting confidence limits on graphs	27-Jan	Tutorial #4: How good are our estimates, and practice with sample size estimation
30-Jan	Types of sampling: simple random sampling, systematic and stratified sampling, random number table, strata and subpopulations	01-Feb	Predicting a sample sizes for a given margin of error	08-Feb	Tutorial #5 - Sampling and spatial dispersion of organisms
06-Feb	Intro to hypothesis testing - Chap. 12: inferential statistics, main steps in hypothesis-testing, null hypothesis, alternate hypothesis, level of significance, test statistic, one and two-tailed tests, t-tables	08-Feb	Quiz I	10-Feb	Tutorial #6: Comparing two samples
13-Feb	Review Quiz & F-test and t-test for independent samples	15-Feb	Paired t-test, paired vs independent data [Re-scheduled if necessary due to RRM 204 field course]	17-Feb	Tutorial #7 Comparing two samples [Re-scheduled if necessary due to RRM 204]
20-Feb	Reading Week Feb 22-24	22-Feb	Reading Week Feb 20-24	24-Feb	Holiday: Heritage Day
27-Feb	Transforming data - tool when failing to meet assumptions; [Re-scheduled if necessary due to RRM 204]	01-Mar	Non-parametric tests - Wilcoxon & Mann Whitney tests	03-Mar	Tutorial #8: Non-parametric tests
06-Mar	Chi-square tests - Chap. 13, Type I and Type II errors	08-Mar	Quiz II - Open book exam	10-Mar	Tutorial #9: Chi-squared tests
13-Mar	What is ANOVA? How to compare multiple means? Partitioning a sum of squares. Understanding an ANOVA table	15-Mar	ANOVA (continued)	17-Mar	Tutorial #10: Comparing several samples, ANOVA
20-Mar	Intro to bivariate data, scatter plots, linear and curvilinear plots, correlation.	22-Mar	Pearson correlation coefficient, Spearman rank correlation	24-Mar	Tutorial #11: Correlation
27-Mar	Regression - Chap. 15: dependent and independent variables, line of best fit, regression line, regression coefficients, simple linear regression assumptions	29-Mar	Regression & correlation continued...	31-Mar	Tutorial #12 - Regression
03-Apr		05-Apr		07-Apr	Holiday: Good Friday
10-Apr	Holiday: Easter Monday	12-Apr	** Wednesday - runs on Monday schedule - Review lecture	14-Apr	FINAL EXAM 1-4 PM to be confirmed
Notes:	Readings refer to the course text (Fowler et al. 1998),		* Thursday April 13 - runs on Friday schedule - Review tutorial - optional		