Yukon University

COURSE OUTLINE
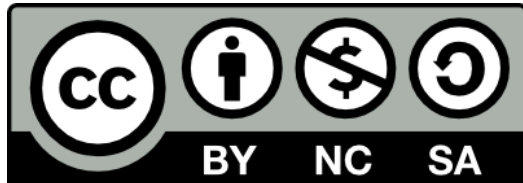
RRMT 202
Statistics for Biological Sciences

3 CREDITS

PREPARED BY: Scott Gilbert, Instructor
DATE: December 18, 2020

APPROVED BY: Joel Cubley, Chair, School of Science
DATE: December 21, 2020

Statistics for Biological Sciences

INSTRUCTOR: Scott Gilbert, B.Sc., PhD   **OFFICE HOURS:** Mon / Wed 9:30 -10:30 via Zoom software or by email appointment.

OFFICE LOCATION: A2515   **CLASSROOM: Lecture:** via Zoom
                                                                  Tutorial: via Zoom

E-MAIL: sgilbert@yukonu.ca   **TIME: Lecture:** Mon /Wed 10:30 – 11:55
                                                             Tutorial: Fri 10:00 – 11:55

TELEPHONE: 867-668-8776   **DATES:** Jan. 4 – April 16, 2021

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 tutorials during the Winter 2020 term will be held online using Zoom software so students will require a suitable computer with a stable internet connection. A headset with microphone is also recommended. Students will need a way to scan or capture images of their assignments so they can submit online as PDF files.

EQUIVALENCY OR TRANSFERABILITY

Please see the BC Transfer Guide for transferability options http://bctransferguide.ca/

LEARNING OUTCOMES
Students that 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). In response to the 2020 SARS COV-2 pandemic our lectures will be delivered online using Zoom during the scheduled lecture time slot (i.e. synchronously). Students are strongly encouraged to participate in lectures so they can take part in class discussions and problem-solving exercises. Efforts will be made to record and post the Zoom lectures online but students should participate in each class rather than relying on the video archive.

Tutorials: Two hours per week using Zoom video conferencing software. 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 will be one data collecting exercise in February; during our field trip, on snowshoes, we will collect snow depths so we can compare two contrasting areas along McIntyre Creek. Tutorial times may be moved to accommodate the tentative RRMT 201 schedule on Jan. 29.

ASSESSMENTS:

Attendance & Participation

Students are expected to participate in both lectures and 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 midterm examination we will have two shorter quizzes. The final exam is scheduled for Friday, April 16 from 9:00- noon; it will be comprehensive and cover all topics taken up during the term. If changes due to the SARS Cov-2 pandemic require a switch to online rather than face to face testing for the midterm or final exams then marks will be re-distributed according to *Plan B* in the table below.

EVALUATION:

		Plan B
Tutorial assignments	40%	70%
Midterm exams (2 @15% each)	30%	20%
Final Exam	30%	10%
Total	100%	100%

REQUIRED TEXTBOOKS AND MATERIAL

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

ACADEMIC AND STUDENT CONDUCT

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when a student submits work for credit that includes the words, ideas, or data of others, without citing the source from which the material is taken. Plagiarism can be the deliberate use of a whole piece of work, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Students may use sources which are public domain or licensed under Creative Commons; however, academic documentation standards must still be followed. Except with explicit permission of the instructor, resubmitting work which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the University.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon University recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon University program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukonu.ca/yfnccr.

ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon University Academic Regulations (available on the Yukon University website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC): lac@yukonu.ca.

TOPIC OUTLINE – *Dec. 18 draft*

Mon	Lecture Topic	Wed	Lecture Topic
4-Jan	Chap. 1 & 2: statistics, observations, scales of measurement (nominal, ordinal, interval & ratio), coefficient of variation, descriptive & inferential statistics, discrete & continuous variables, precision, accuracy	6-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	Normal Dist'n - Chap. 9: types of distributions, z-scores, standardizing a normal curve, z-table, one and two-tailed regions, level of significance
18-Jan	Confidence limits - Chap. 11: sampling distribution , standard error, Central Limit theorem, confidence limits, t-table	20-Jan	Confidence limits (con'd)
25-Jan	Plotting confidence limits on graphs, predicting a sample sizes for a given margin of error	27-Jan	Types of sampling: simple random sampling, systematic and stratified sampling, random number table, strata and subpopulations
1-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	3-Feb	Comparing two means: t-test, F-test to check assumption that variances are similar
8-Feb	F-test and t-test for independent samples	10-Feb	**Quiz I**
15-Feb	Transforming data - tool when failing to meet	17-Feb	Paired t-test, paired vs independent data,
22-Feb	**Reading Week** Feb 22-26	24-Feb	**Reading Week** Feb 22-26
1-Mar	Non parametric tests Mann Whitney & Wilcoxon	3-Mar	Chi-square tests - Chap. 13, Type I and Type II errors
8-Mar	Chi-squared (continued)	10-Mar	**Quiz II** - Open book exam
15-Mar	What is ANOVA? How to compare multiple means? Partitioning a sum of squares. Understanding an ANOVA table	17-Mar	ANOVA (contiued)
22-Mar	Intro to bivariate data, scatter plots, linear and curvilinear plots, correlation.	24-Mar	Pearson correlation coefficient, Spearman rank correlation
29-Mar	Regression - Chap. 15: dependent and independent variables, line of best fit, regression line, regression coefficients, simple linear regression assumptions	31-Mar	Regression & correlation continued...
5-Apr	**Holiday:** Easter Monday	7-Apr	
12-Apr	Finale - review	13-Apr	** Tuesday - runs on Friday schedule - Review tutorial - optional

Chapter readings refer to the course text by Fowler et al. (1998).

Fri	Tutorial Topic
8-Jan	Online orientation
15-Jan	Tutorial #1: Computer Lab: using Excel to prepare descriptive statistics
22-Jan	Tutorial #2: Plotting freq dist'ns and using the Histogram feature in Excel
29-Jan	Tutorial #3: Working with normal curves
5-Feb	Tutorial #4: How good are our estimates, and practice with sample size estimation
12-Feb	Tutorial #5 Comparing means
19-Feb	Tutorial #6: Comparing two samples
26-Feb	**Holiday:** Heritage Day
5-Mar	Tutorial #7: Non-parametric tests
12-Mar	Tutorial #8: Chi-squared tests
19-Mar	Tutorial #9: Comparing several samples, ANOVA
26-Mar	Tutorial #10: Correlation
2-Apr	**Holiday:** Good Friday
9-Apr	Tutorial #11 - Regression