YukonCollege

COURSE OUTLINE

RRMT 202

Statistics for Biological Sciences

45 **HOURS**
3 **CREDITS**

PREPARED BY: Scott Gilbert, Instructor   DATE: December 19, 2018

APPROVED BY:Margaret Dumkee, Dean   DATE: December 20, 2018

APPROVED BY ACADEMIC COUNCIL: (date)

RENEWED BY ACADEMIC COUNCIL: (date)

Statistics for Biological Sciences

INSTRUCTOR: Scott Gilbert, B.Sc., Ph.D. Lisa Kanary, Ph.D.	**OFFICE HOURS:** *SG:* Wed 10:30 - noon Fri 11 am – noon *LK*: *by appt.* Thurs. 9:00-noon
OFFICE LOCATION: A2515 (Gilbert) A2433 (Kanary)	**CLASSROOM:** Lecture: Mon. T1082, Wed. A2702 Lab: A2408 (Computer lab)
EMAIL: sgilbert@yukoncollege.yk.ca lkanary@yukoncollege.yk.ca	**TIME:** Lecture: Mon. 9:00 -10:30 am Wed. 10:30-noon Lab: Friday, 1 - 3 pm
TELEPHONE: 668-8776, Scott Gilbert na; Lisa Kanary	**Dates:** January 4 – April 10, 2019 + final exam to be scheduled after April 10

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.

EQUIVALENCY or TRANSFERABILITY

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

LEARNING OUTCOMES:

Students that successfully complete this course will:
- Understand how statistics can be used to describe the range of variation in biological systems.
- Be able to analyze a set of raw data and describe it using graphs, such as frequency distributions as well as descriptive statistics.

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

DELIVERY METHODS

This is a lecture based course that incorporates "hands on", practical exercises in weekly, two-hour tutorials as well as occasional group problem solving activities during class. Students will work with existing data sets they collected in previous courses to carry out statistical analysis.

COURSE FORMAT

Lectures: Three hours per week (2 classes of 1.5 hours)
Tutorial: Two hours per week. 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.

COURSE REQUIREMENTS

ASSESSMENTS

Attendance
Attendance at all lectures is expected. 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. There is a strong correlation between regular attendance and academic performance in this course.

Assignments and Tests
Students will have ample opportunity to chart their progress in this course. Rather than a single mid-term examination there will be three tests in class at the end of key sections. Students will also receive a grade for each weekly tutorial exercise.

Evaluation

Quiz 3 @ 10%	30%
Tutorial Activities	40%
Final Exam	30%
Total	100%

REQUIRED TEXTBOOKS

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 & Regulations web page.

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when students present the words of someone else as their own. Plagiarism can be the deliberate use of a whole piece of another person's writing, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material. Whenever the words, research or ideas of others are directly quoted or paraphrased, they must be documented according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Resubmitting a paper 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 College.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon College 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 College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukoncollege.yk.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 College Academic Regulations (available on the Yukon College 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) at (867) 668-8785 or lassist@yukoncollege.yk.ca.

TOPIC OUTLINE / SYLLABUS
Lecture Schedule

Mon		Lecture Topic	Wed		Lecture Topic
7-Jan	BSG	Chap. 1 & 2: statistics, observations, scales of measurement (nominal, ordinal, interval & ratio), coefficient of variation, descriptive & inferential statistics, discrete & continuous variables, precision, accuracy	9-Jan	BSG	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
14-Jan	BSG	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	16-Jan	BSG	Normal Dist'n - Chap. 9: types of distributions, z-scores, standardizing a normal curve, z-table, one and two-tailed regions, level of significance
21-Jan	BSG	Confidence limits - Chap. 11: sampling distribution , standard error, Central Limit theorem, confidence limits, t-table	23-Jan	BSG	Confidence limits (continued)
28-Jan	BSG	Plotting confidence limits on graphs, predicting a sample sizes for a given margin of error	30-Jan	BSG	Types of sampling: simple random sampling, systematic and stratified sampling, random number table, strata and subpopulations
4-Feb	BSG	Failing to meet assumptions- transforming data (Chapter 10)	6-Feb	BSG	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
11-Feb	BSG	Comparing two means: t-test, F-test to check assumption that variances are similar	13-Feb	BSG	F-test and t-test for independent samples
18-Feb	LK	Reading Week Feb 18-22	20-Feb	LK	Reading Week Feb 18-22
25-Feb	LK	Paired t-test, paired vs independent data,	27-Feb	LK	Non-parametric alternatives
4-Mar	LK	TBD	6-Mar	LK	**Quiz 2**
11-Mar	LK	Chi-square tests - Chap. 13, Type I and Type II errors	13-Mar	LK	Chi-squared (continued)
18-Mar	LK	What is ANOVA? How to compare multiple means? Partitioning a sum of squares. Understanding an ANOVA table	20-Mar	LK	ANOVA (continued)
25-Mar	LK	Intro to bivariate data, scatter plots, linear and curvilinear plots, correlation.	27-Mar	LK	Pearson correlation coefficient, Spearman rank correlation
1-Apr	LK	Regression - Chap. 15: dependent and independent variables, line of best fit, regression line, regression coefficients, simple linear regression assumptions	3-Apr	LK	**Quiz 3** (tentative date)
8-Apr	LK	Regression & correlation wrap up	10-Apr	LK + BSG	Course Finale - review
Notes: Readings refer to the course text (Fowler et al. 1998) BSG = Scott Gilbert; LK= Lisa Kanary **Schedule version:** Dec. 19, 2018					

Tutorial Schedule

Friday		Tutorial Topic
4-Jan	BSG	Tutorial #1: Computer Lab: using Excel to prepare descriptive statistics
11-Jan	BSG	Tutorial #2: Plotting freq dist'ns and using Histogram feature in Excel
18-Jan	BSG	Tutorial #3: Working with normal curves
25-Jan	BSG	Tutorial #4: How good are our estimates & practice with sample size estimation
1-Feb	BSG	**QUIZ 1** - Tutorial #5: Snow depth data collection - Field trip to Fish Lake Road - Timing to be discussed
8-Feb	BSG	Tutorial #6: Hypothesis testing - comparing means
15-Feb	BSG	Tutorial #7: Comparing two samples
22-Feb		*Heritage Day holiday*
1-Mar	LK	Tutorial #8: Practice with parametric and non-parametric problems
8-Mar	LK	Tutorial #9: TBD
15-Mar	LK	Tutorial #10: Introduction to Chi-squared tests
22-Mar	LK	Tutorial 11: Comparing several samples, ANOVA
29-Mar	LK	Tutorial #12: Correlation
5-Apr	LK	Tutorial #13: Regression
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