DIVISION OF APPLIED SCIENCE & MANAGEMENT
School of Science
Winter, 2015

COURSE OUTLINE

RRMT 202

Biometrics

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

PREPARED BY: _____ DATE: _____
Scott Gilbert, Instructor

APPROVED BY: _____ DATE: _____
Margaret Dumkee, Dean

YUKON COLLEGE
January, 2015

Course Outline prepared by Scott Gilbert, December, 2014.

Yukon College
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BIOMETRICS

INSTRUCTOR: Scott Gilbert, B.Sc., Ph. D.; Tara Stehelin, B. Sc., M. Sc

OFFICE HOURS: By appointment
OFFICE LOCATION: A2515 (Gilbert), A2806 (Stehelin)

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COURSE OFFERINGS:
DAYS & TIMES

Lecture: Mon. & Wed.
Time: 10:30- noon
Room: C1530

Lab: Friday
Time: 1:00-3:00 pm
Room: A2702

COURSE DESCRIPTION

Biometrics is the study of biological variation and numerical (statistical) analysis. This course is designed as an introductory course for students preparing for a career in some area of field biology. Graduates will very 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 statistical techniques used to describe variation. Secondly we will 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.

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).

PREREQUISITES
Enrolment in Renewable Resource Management Program

EQUIVALENCY or TRANSFERABILITY

Please see the BC Transfer Guide for transferability options.

DELIVERY METHODS / FORMAT (3-2)
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. There will be weekly problem sets to work through for each tutorial and students will be expected to use computer spreadsheets for many analyses.

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.

Assignments and Tutorials
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%
	100%

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.

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.

REQUIRED TEXTBOOKS

Fowler, Jim and Lou Cohen Practical Statistics for Field Biology. 1998. 2nd Ed.

TOPIC OUTLINE / SYLLABUS
Lecture Schedule

Monday		Lecture Topic	Wednesday		Lecture Topic
5-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	7-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
12-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	14-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
19-Jan	BSG	Confidence limits - Chap. 11: sampling distribution , standard error, Central Limit theorem, confidence limits, t-table	21-Jan	BSG	Confidence limits (con'd)
26-Jan	BSG	Plotting confidence limits on graphs, deciding on sample sizes for a given margin of error	28-Jan	BSG	**Quiz I -** Sample size estimation (con'd)
2-Feb	BSG	Types of sampling: simple random sampling, systematic and stratified sampling, random number table, strata and subpopulations	4-Feb	TS	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
9-Feb	TS	Comparing two means: t-test, F-test to check assumption that variances are similar	11-Feb	TS	F-test and t-test for independent samples
16-Feb		Failing to meet assumptions- transforming data	18-Feb	TS	paired t-test, paired vs independent data,
23-Feb	TS	**Quiz II**	25-Feb	BSG	Non parametric tests Mann Whitney & Wilcoxon
2-Mar		Chi-square tests - Chap. 13, Type I and Type II errors	11-Mar	BSG	Chi-squared (continued)
9-Mar	BSG	What is ANOVA? How to compare multiple means? Partitioning a sum of squares. Understanding an ANOVA table		BSG	ANOVA (contiued)
14-Mar		Reading Week March 16-20	16-Mar		Reading Week March 16-20
23-Mar	TS	Intro to bivariate data, scatter plots, linear and curvilinear plots, correlation.	25-Mar	TS	Pearson correlation coefficient, Spearman rank correlation
30-Mar	TS	Regression - Chap. 15: dependent and independent variables, line of best fit, regression line, regression coefficients, simple linear regression assumptions	1-Apr	TS	**Quiz 3**
6-Apr		Holiday: Easter Monday	8-Apr	TS	Finale - review
	Notes:	Readings refer to the course text (Fowler et al. 1998),			
		BSG = Scott Gilbert, TS= Tara Stehelin			
		Schedule version: October 25, 2014			

Tutorial Schedule

Friday		Tutorial Topic
9-Jan	BSG	Tutorial #1: Computer Lab: using Excel to prepare descriptive statistics
16-Jan	BSG	Tutorial #2: Plotting freq dist'ns and using Histogram feature in Excel
23-Jan	BSG	Tutorial #3: Working with normal curves
30-Jan	BSG	Tutorial #4: How good are our estimates? Special Thursday tutorial 2:30-4:30 A2704
6-Feb	TS	Tutorial #5: Sample size estimation
13-Feb	TS	Tutorial #6: Comparing means
20-Feb		Heritage Day holiday
27-Feb	BSG	Tutorial #7: Comparing two samples
6-Mar	BSG	Tutorial #8:Chi-squared tests
13-Mar	BSG	Tutorial #9: Comparing several samples, ANOVA
18-Mar		Reading Week March 14-18
27-Mar	TS	Tutorial #10: Correlation
3-Apr		Holiday: Good Friday
10-Apr	TS	Tutorial #11 - Regression