



UNIVERSITY OF
ALBERTA



REN R 480

EXPERIMENTAL DESIGN AND DATA ANALYSIS FOR ENVIRONMENTAL SCIENCES

In Fall 2018, REN R 480, *Experimental Design and Data Analysis for Environmental Sciences*, is being offered at Yukon College as part of the Northern Environmental and Conservation Sciences Program. All students registered in REN R 480 must adhere to the requirements outlined in this course syllabus. University of Alberta students must also be aware of, and adhere to, the University's Code of Student Behaviour, referenced in the outline.

INSTRUCTOR:	DR. KATHRYN AITKEN Adjunct Professor, Dept. of Renewable Resources, U of Alberta, and Instructor/Coordinator, Northern Environmental and Conservation Sciences Program, Yukon College
OFFICE HOURS:	Monday and Wednesday, 10:30-12:00
OFFICE LOCATION:	A2509
TELEPHONE/E-MAIL:	668-8866 / kaitken@yukoncollege.yk.ca

DAYS & TIMES:	Lectures:	Tuesday & Thursday, 4:00-5:30, A2103
	Labs:	Wednesday, 2:30-5:30, A2702 (student computer lab)

COURSE DESCRIPTION

Introduction to the scientific method; presentation of quantitative data in ecology, conservation and environmental sciences; common research approaches and experimental designs; fundamental concepts of statistics; classical hypothesis testing; parametric and non-parametric statistical tests; tests for binomial data; linear, non-linear, and multiple regression.

STUDENT LEARNING OUTCOMES AND COMPETENCIES

On successful completion of this course, students will:

- 1) Understand the fundamental concepts of statistics and empirical research.
- 2) Understand the basics of experimental and sampling designs, and recognize common design pitfalls and misinterpretation of results.
- 3) Be able to use basic statistical methods to analyze ecological data, and understand the conditions and objectives under which each method is applicable.
- 4) Be able to formulate an experimental or sampling design to examine a research question, and organize and analyze a set of ecological data.

COURSE FORMAT (3-0-3)

The course consists of two 1.5-hour lectures and one 3-hour computer lab each week. Labs will consist of a short written assignment, or hands-on data summaries and analyses using the statistical methods discussed during the lectures. Most labs will include completion of a short assignment to be handed in at the end of the lab.

COURSE PREREQUISITES AND/OR CO-REQUISITES

U of A STAT 151, Yukon College MATH 105 or RRMT 202, or an equivalent introductory statistics course is strongly recommended. Registration in Yukon College/University of Alberta B.Sc. in Environmental and Conservation Sciences degree program or permission of instructor.

REQUIRED TEXTBOOKS/MATERIALS

Whitlock M, Schluter D. 2015. *The Analysis of Biological Data*. 2nd edition. Greenwood Village (CO): Roberts and Company Publishers, Inc. 818 p. ISBN-13: 978-1936221486. Available in Yukon College bookstore. First edition is also fine.

All students must have a valid Yukon College student computing account. Students should ensure that they have activated their computer lab account AND Moodle account prior to the start of classes. For more information, visit: <https://www.yukoncollege.yk.ca/student-life/technical-resources>.

COURSE WEBSITE

PowerPoint presentations, computer lab exercises, homework assignments, and other resources will be available on the REN R 480 class site on Moodle (via www.yukoncollege.me).

UNIVERSITY OF ALBERTA ACADEMIC INTEGRITY AND CODE OF STUDENT BEHAVIOUR

Academic Integrity

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.governance.ualberta.ca) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Code of Student Behaviour

All students at the University of Alberta are subject to the Code of Student Behaviour, as outlined at: <http://www.governance.ualberta.ca/en/CodesofConductandResidenceCommunityStandards/CodeofStudentBehaviour.aspx>. Please familiarize yourself with it and ensure that you do not participate in any inappropriate behavior as defined by the Code. Key components of the code include the following statements.

30.3.2(1) No Student shall submit the words, ideas, images or data of another person as the Student's own in any academic writing, essay, thesis, project, assignment, presentation or poster in a course or program of study.

30.3.2(2) c. No Student shall represent another's substantial editorial or compositional assistance on an assignment as the Student's own work.

PROFESSIONALISM AND CLASSROOM RULES OF ENGAGEMENT

Students are expected to attend all lectures and labs, be engaged and courteous in all course activities, and to be on time for class. Please do not use cellular phones during class. Laptops are permitted for note taking and in-class work; however, please do not use laptops in class for non-class-related activities. While in computer labs, students are expected to refrain from using the computers to engage in non-class-related activities (e.g. Facebook, etc.).

COURSE REQUIREMENTS/EVALUATION

Assignments

There will be several in-lab or take-home assignments that involve a short written exercise and/or analysing or summarizing a set of data (provided by the instructor). The assignments and exercises will integrate methods and topics discussed during the lectures and will enable the student to gain hands-on experience working with real ecological data, conducting statistical analyses, and writing up results.

Exams

There will be one midterm examination and a final examination. The midterm will be held during class time on Oct 23. The final will be held at the end of term, during the scheduled Yukon College exam period. It will cover lecture and lab material from the entire course.

Missed Midterm Exam: At the discretion of the instructor, a student who misses the midterm exam may be allowed to write the exam at a new time decided after discussion with the instructor OR the weight of the midterm may be transferred to the final exam.

Missed Final Exam: Instructors can neither give permission to a student to miss the final exam nor grant a request for a deferred final exam. Students are encouraged to check exam schedules prior to making travel or event plans. The decision to grant a deferred final exam can only be granted by their own Faculty (B.Sc. Northern ENCS students must speak with an ENCS Program Advisor at Yukon College). Acceptable reasons for an excused absence may include illness or bereavement, and unacceptable reasons include weddings, travel arrangements or being on vacation. The University policy on deferred exams can be found in Section 23.3.2 of the University Calendar. It includes specific instructions on how to obtain a deferral.

Evaluation

The course grade will be determined as follows:

	Percent
Assignments	50%
Midterm exam (23 Oct)	20%
Final exam	30%

Due Dates and Late Assignments

Late assignments will lose 5% of their value per day that they are late, to a maximum of 1 week late, unless the student has received a written extension from the instructor. Assignments are due (unless otherwise specified) by 11:59 pm PST on the date that they are due.

Assignment of grades

The total numerical score will be converted to a grade on University of Alberta's letter grading system:

Percent	Letter grade
95-100	A+
90-94	A
85-89	A-
79-84	B+
75-78	B
71-74	B-
67-70	C+
64-66	C
55-63	C-
50-54	D
0-49	F

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): lac@yukoncollege.yk.ca.

LECTURE AND LAB TOPIC SCHEDULE (subject to change)

Week	Date	Topic(s)
1	6 Sept	Introduction & course overview
2	11-13 Sept	Framing and testing hypotheses; manipulative vs correlational approaches
		Replication, pseudoreplication and randomization
3	18-20 Sept	Pseudoreplication, cont'd; Intro to R
		Types of experimental designs; Intro to R, cont'd
4	25-27 Sept	Types of experimental designs, cont'd
		Taking measurements and recording data
5	2-4 Oct	Statistical hypothesis testing - null distribution, <i>P</i> -values, Type I and Type II errors, power
		Statistical hypothesis testing – power, cont'd
6	9-11 Oct	Data management and exploration - summary statistics
		Data management and exploration – summary statistics, cont'd
7	16-18 Oct	Data management and exploration - data transformation
		No class
8	23-25 Oct	MIDTERM (23 Oct)
		Review of basic comparisons
9	30 Oct- 1 Nov	Review of correlation
		Regression (simple linear regression, least squares method)
10	6-8 Nov	Regression, cont'd (variance components, ANOVA tables)
		Regression, cont'd (assumptions of regression, diagnostic tests)
11	13-15 Nov	Regression, cont'd (other kinds of regression)
		Analysis of Variance (one-way ANOVA; ANOVA for randomized block, nested, two-way, <i>n</i> -way, repeated measures designs)
12	20-22 Nov	ANOVA cont'd (plotting ANOVA results, understanding interaction terms, multiple comparisons and Bonferroni corrections)
		Guest presentations
13	27-29 Nov	Analysis of categorical data
		Guest presentations
14	4 Dec	Review for final exam
	TBD	FINAL EXAM – during Yukon College exam period