



RENr 480

APPLIED STATISTICS FOR ENVIRONMENTAL SCIENCES

In Fall 2020, RENr 480, Applied Statistics for Environmental Sciences, is being offered at Yukon University as part of the Northern Environmental and Conservation Sciences, B.Sc. Program. All students registered in RENr 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:	Kathryn Aitken, Ph.D. Adjunct Professor, Dept. of Renewable Resources, U of Alberta, and Instructor/Coordinator, Northern Environmental and Conservation Sciences Program, Yukon University
OFFICE HOURS:	By appointment (email to set up; appointments held via Zoom or phone)
OFFICE LOCATION:	A2509 (BUT access to YukonU campus in fall 2020 will be limited and I will not be available for in-person meetings. Email is the best way to reach me).
TELEPHONE/E-MAIL:	668-8866 / kaitken@yukonu.ca
LAB INSTRUCTOR:	Jared Gonet, M.Sc., jared.gonet@yukonu.ca

CLASS DAYS & TIMES:	Lectures: Online asynchronous – recordings, readings, and other material will be posted on Moodle. Labs: Wednesdays, 2:30-4:00, via Zoom. Attendance is optional but is recommended as the lab instructor will be available to provide information and help for the week's assignment, as necessary.
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COURSE DESCRIPTION:

Focuses on problem formulation, method selection, and interpretation of statistical analysis. Covers data management and data visualization, statistical tests for parametric, non-parametric and binomial data, linear and non-linear regression approaches. Participants will gain general statistical literacy and learn how to visualize and analyze data with open-source software packages.

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 (3-0-1.5):

The course consists of 3 hours of lecture material and 1.5-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 (due before the start of the following week's lab session).

Note that in fall 2020, lecture material will be delivered online via the class site in YukonU's Moodle system. There will be no synchronous lectures; all material will be delivered asynchronously. Lab sessions will be synchronous via Zoom; participation is not mandatory but students are strongly encouraged to attend in order to receive information and help for the week's assignment.

COURSE PREREQUISITES AND/OR CO-REQUISITES:

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

REQUIRED TEXTBOOKS/MATERIALS:

Readings will be posted on the class site on Moodle (moodle.yukonu.ca).

An optional resource: Whitlock M, Schluter D. 2020. The Analysis of Biological Data. 3rd edition. W.H. Freeman and Company. 818 p. ISBN: 9781319226237. An e-book version is available online for purchase or for rent (<https://www.macmillanlearning.com/college/ca/product/Analysis-of-Biological-Data/p/131922623X>).

All students must have a valid Yukon University student computing account. Students should ensure that they are able to access Moodle prior to the start of classes. For more information, visit: <https://www.yukonu.ca/student-life/technical-resources>.

OTHER COURSE REQUIREMENTS:

Because the course will be delivered online, students will require a computer with a stable internet connection. A headset with microphone is recommended.

Many of the assignments will require the use of the free open-source statistical software R and R Studio. Information on R can be found here: <https://www.r-project.org/>. Information on R Studio can be found here: <https://rstudio.com/products/rstudio/download/>. We will discuss how to download and install R and R Studio at the beginning of the course. Students must have a laptop or desktop computer that will run R and R Studio. System requirements are given at the links above.

Students will also be expected to use Microsoft Excel and Word during the course. YukonU students can download for free the full suite of Microsoft Office applications (Word, Excel, PowerPoint, OneNote, Outlook) and other internet based services (OneDrive, Sway, etc). Information is available here: <https://www.yukonu.ca/student-life/technical-resources> (scroll down to the section "Office 365 & Email").

COURSE WEBSITE

Lecture recordings, readings, PowerPoint presentations, computer lab exercises, homework assignments, and other resources will be available on the REN R 480 class site on Moodle (via moodle.yukonu.ca).

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:

<https://www.ualberta.ca/governance/resources/policies-standards-and-codes-of-conduct/code-of-student-behaviour>. 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.

COURSE REQUIREMENTS/EVALUATION:

Attendance and Participation

Attendance during synchronous lab sessions is not mandatory but students who join the sessions will be able to receive immediate help with their computer assignments, as well as engage with the instructor(s) and other students.

Assignments

There will be several lab exercises (approximately weekly) that involve a short, written exercise and/or analysing or summarizing a set of data (provided by the instructor). These exercises will integrate methods and topics introduced in the lecture material and will enable the student to gain hands-on experience working with real ecological data, conducting statistical analyses, and writing up results.

There will also be several short literature search assignments in which students will conduct a search of peer reviewed scientific literature to find papers that incorporate the statistical tests discussed in lecture, and post brief summaries on the class site on Moodle. More information will be distributed in class.

Exams

There will be no formal midterm or final examinations in the course. The final assessment will be a data analysis assignment, in which students will apply the skills and concepts they have learned during the course to datasets provided to them by the instructor. The assignment instructions and datasets will be distributed the week of Nov. 30, and the final assignment will be **due by Friday, Dec. 11**.

Due Dates and Late Assignments

Lab exercises are due (unless otherwise specified) by 2:30 pm Pacific time on the Wednesday following distribution of the assignment. Late lab exercises will **NOT** be accepted, **unless** the student has received a written extension from the instructor. Other assignments will lose 5% of their value per day that they are late, to a maximum of 1 week late after which they will not be accepted, unless the student has received a written extension from the instructor.

Evaluation

The course grade will be determined as follows:

	Percent
Lab exercises	40%
Statistical test literature searches and summaries	25%
Final data analysis assignment (due Dec. 11)	35%
Total	100%

Assignment of grades

The total numerical score will be converted to a letter grade on the following scale:

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

RECORDING OF LECTURES, LABS, ETC.:

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Please note, however, that in fall 2020, synchronous lab sessions held via Zoom will be recorded for viewing by students unable to attend. Links will be posted on the class Moodle site and will ONLY be available to students registered in the course.

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, they should contact the Learning Assistance Centre (LAC): lac@yukonu.ca.

TOPIC OVERVIEW:

- Framing and testing hypotheses
- Replication, pseudoreplication and randomization
- Types of experimental designs
- Sampling
- Statistical hypothesis testing, and power
- Data management and exploration
- Data transformation
- Basic comparisons
- Correlation
- Regression (linear regression, non-linear regression, multiple regression, logistic regression, regression diagnostics)
- ANOVA (one-way, two-way, randomized block ANOVA, other kinds of ANOVA)
- Analysis of categorical data, contingency tables