

RenR 480/711 – Fall 2017 Syllabus

Experimental Design and Data Analysis in the Environmental Sciences

Course Title	Experimental Design and Data Analysis in the Environmental Sciences
Course Code	RenR 480/711 - Section II
Term	Fall 2017 (Start: September 5, End: December 8)
Website	www.ualberta.ca/~montwe/statistics
Instructor	Dr. David Montwé, Postdoctoral Fellow Office: 815 General Services Building Email: david.montwe@ualberta.ca Office Hours: By appointment
Assistant	Miriam Isaac-Renton Office: 815 General Services Building Email: isaacren@ualberta.ca Office Hours: By appointment
Classes & Labs	Tu & Th 8:00 to 9:20am Room 3-03 Mech. Engineering Building (MEC) Th 12:30 to 13:50 Room 3-03 Mech. Engineering Building (MEC)
No classes	Nov 14 & 16 (Fall Term reading week), Dec 7 pm (only pm lab canceled)
No classes 480	Oct 24, 26 & Dec 5 (RenR 711 project presentations)
Credits	*3 credits

Important Dates

September 18th is the fall registration deadline (for full refund). If a course is dropped before Oct 5, students will be assessed a partial fee; after this date, the full fee will be assessed. *Please confirm on the University of Alberta Academic Schedule online. In case of discrepancy, the website is always taken as accurate.

Course Description

Experimental design and data analysis in the environmental sciences *3 (fi 6) (first term, 3-0-3). Introduction to the scientific method; presentation of quantitative data in forestry, conservation and environmental sciences; common research approaches and experimental designs; fundamental concepts of statistics; classical hypothesis testing and effect size statistics; parametric and non-parametric statistical tests; tests for binomial data; linear, non-linear, and multiple regression. **Pre-Requisites:** A minimum of *60 of university-level courses; *3 introductory statistics recommended.

References and Readings

None required, but more detail can be found in: The Analysis of Biological Data by Whitlock & Schluter.

Course Evaluation and Grading

RenR 480 (undergraduate level)

	<i>Percent</i>	<i>Due Date</i>
Participation (showing up in class, asking questions, helping others, letting yourself be helped)	20	N/A
Assignments (3 at 10% each for RenR 480)	30	TBA
Course notes for RenR 480 only (bring to exam for submission or email to david.montwe@ualberta.ca by noon, Dec 7)	20	Dec 7
Final Exam (on last day of RenR 480 class: Dec 7, 8am)	30	N/A

RenR 711 (graduate level)

	<i>Percent</i>	<i>Due Date</i>
Participation (showing up in class, asking questions, helping others, letting yourself be helped)	20	N/A
Draft Project (5 min presentation and website for RenR711)	20	Oct 26
Final Project (5 min presentation and website for RenR711)	30	Dec 5
Final Exam (on last day of RenR 711 class: Dec 7, 8am)	30	N/A

Late Submissions: 10% deduction per day. Deadline for late submissions of any kind: **Dec 8**

Previous years' projects: <http://tinyurl.com/renr480projects>

Course Themes and Student Learning Outcomes

Experimental Design

- RenR 480/711: Gain fundamental knowledge in statistical concepts. Learn how to use statistics in science.
- RenR 480/711: Learn the basics of experimental and sampling designs, and be aware of common design pitfalls and misinterpretations of results.

Data Management and Exploratory Graphics

- RenR 480/711: Learn good practices in collecting and organizing data.
- RenR 480/711: Gain experience organizing and checking data through laboratory exercises and/or student projects.
- RenR 480/711: Evaluate the nature of your data through graphical display.

Data analysis: Descriptive Statistics

- RenR 480/711: Evaluate the nature of your data through descriptive statistics.
- RenR 480/711: Know the appropriate graph for different objectives.
- RenR 480/711: Generate publication-quality scientific graphs.

Data analysis: Inferential Statistics

- RenR 480/711: Gain an overview of statistical methods and know when to use each method.
- RenR 480/711: Know when to use a test, know its assumptions and what to report for:
 - T-test
 - F-test

- ANOVA
- Multiple comparisons (post-hoc tests)
- Chi-square
- Z-test for proportions
- Nonparametric methods
- Linear and non-linear regression
- Correlations
- RenR 480/711: Perform data transformations, and manage missing values.
- RenR 711: Application of statistical methods through the course project.

Data Visualization and Communication in Science

- RenR 711: Gain experience in project planning and development by creating a scientific project.
- RenR 711: Gain experience effectively communicating research through a presentation and website.
- RenR 711: Learn how to effectively participate in scientific discussions, evaluate scientific work, provide feedback and make contributions to the scientific community.

Implementation

- RenR 480/711: Learn to work with the R and R Studio software. R is free, open source, and has comprehensive statistics packages and data visualization capacities. R Studio provides a more efficient interface for analysis in R.

Plagiarism and Cheating:

The University of Alberta is committed to highest standards of academic integrity and honesty. Students must be familiar with standards regarding academic honesty and uphold policies of the University. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students at the University of Alberta are subject to the Code of Student Behaviour, as outlined in the 2015/2016 University Calendar. Students should familiarize themselves with the current version of the code and ensure they do not participate in any inappropriate behaviour as defined by it. Key components of the code specific to this course include the following statements. Plagiarism: 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. Cheating: no student shall represent another's substantial editorial or compositional assistance on an assignment as the student's own work. The most recent version of the Code of Student Behaviour can be found on line on the University of Alberta web site.

Students should speak with the course instructor about any questions or concerns about the code. Students should be particularly aware of the code as it pertains to internet and library research, use of previous class notes, exams, assignments and other materials of former students.

The Code of Student Behaviour requires students in pre-professional programs to follow the Codes of Practice for those profession(s) the student plans to or is required to enter. This often is a higher standard than Code of Student Behaviour and there are significant consequences for students for violating the Code of Student Behaviour and the profession's code of conduct. The profession may impose strict membership requirements in that professional body, which could be denied with Code of Student Behaviour violations.