BioStatistics
BIOL322 | Fall | 2020

Instructor: Dr. Pedro Peres-Neto, Professor, Department of Biology

Please contact me via Moodle (using its messaging system). But, if Moodle is down and you have an emergency, then contact me at pedro.peres-neto@concordia.ca with BIOL-322 in the subject. For contacting TAs, see below.

Teaching strategy and access to course material and information

Remote teaching strategy: An Intro course in Biostatistics is well suited for remote teaching. We will use a mix of Synchronous & Asynchronous learning. This means that some lectures and lab tutorials will happen in real-time whereas others not. All lectures will be recorded and made available to you regardless whether they were synchronous or asynchronous. Unless communicated, we will be available online (via Zoom) during the regular time slots for both lectures and tutorials.

Access to material: Information on how to access course material (lecture videos, slides, lecture notes, etc) will be posted every week in Moodle. We will have a WebBook structuring the entire course that will be made available online. That means you don't have to download most material and can stream them online.

.info = **SUCCESS**

**CHECK MOODLE, OUR WebBook AND EMAILS ROUTINELY
PAY DETAILED ATTENTION TO INFORMATION**

Lectures & Computer Labs are via Zoom
Zoom links will be posted in Moodle prior to the lecture or lab session

Lectures: Tuesday & Thursday 10:15am-11:30am	Pedro Peres-Neto (Instructor)
Lab tutorials (they start in the week of Sept. 14)	**TA**
Lab section 101: Tuesday 13:15-16:00	Alexandra Engler (alexandra.engler@hotmail.fr)
Lab section 102: Wednesday 13:15-16:00	Gabriel Khattar (khattargabriel@gmail.com)
Lab section 103: Thursday 13:15-16:00	Bastien Bellemin-Noel (basbellemin@gmail.com)
Lab section 104: Friday 13:15-16:00	Hammed Akande (hammed.akande@mail.mcgill.ca)
General support & rotation	Timothy Law (timothy_law@hotmail.com)

**Questions related to lecture & course material: contact the instructor via Moodle
Questions related to lab material: contact your TA via their email**

[Moodle FORUM]: We expect that you ask general questions first to all students via the Moodle Forum. Given the remote distance strategy, we need (more than ever) to generate an environment of cooperation.
[Instructor]: Office hours Tuesdays & Thursdays 9:30AM to 10:30AM - by appointment only; send message via Moodle.
[TA]: Each TA will set up their own schedule for office hours with students in their lab sections.

Course Description: This course is designed to present, explain and practice basic and commonly used statistical techniques applied to biological sciences for data exploration and hypotheses testing. Examples and applications will be drawn from a wide range of fields including cell biology, ecology, epidemiology, genetics, molecular biology and genomics. Lectures will present and explain technical concepts within an applied context and tutorials will provide hands-on data analysis using the statistical software R.

Objectives: Upon successful completion of the course, students will be able to: express scientific questions in a statistical manner; decide which techniques are better suited for different types of biological problems; report statistical results in an effective manner; adapt the knowledge and practice they learned to new biological questions. Formulas (formulae) are presented so that students gain intuition about their nature, but their memorization is not required in exams and in tutorials.

Lectures: The teaching strategy in lectures is to use multiple examples from different fields of biology so that students can gain experience on the technical and application aspects of a multitude of commonly used statistical methods.

Computer-based labs (tutorials): The application and concepts underlying the statistical methods covered in lectures will be practiced using data extracted from real studies covered in class. Applications will be based on the software environment R for statistical computing and graphics.

Statistical software: We will use R, which is a free software environment for statistical computing and graphics. R has become the de facto standard platform for performing statistical analyses in biology. Knowledge of R has now become a skill required in the job markets of many disciplines, including Biology.

Assessment calendar in a glance (details are provided in the next pages)

September	October	November
08	01 Quiz 2	03 **REPORT 2**
10	06 **REPORT 1**	05 Quiz 7
15	08 Quiz 3	10
17	13 **MIDTERM EXAM**	12 Quiz 8
22	15 Quiz 4	17 **MIDTERM EXAM**
24 Quiz 1	20	19 Quiz 9
29	22 Quiz 5	24 **REPORT 3**
	27	26 Quiz 10
	29 Quiz 6	**December** only lectures

10 QUIZZES (0.8% each): posted 48h prior to their deadline (see next pages for details).

3 REPORTS (7% each) posted 2 weeks prior to the deadline (see next pages for details).

2 MIDTERM Exams (15% each)

11 TUTORIAL lab reports: one report each week starting in the 2nd week of classes (1% each report).

1 FINAL Exam (30%; booked by the exam's office)

You should also become familiar with the general Concordia calendar:
http://www.concordia.ca/academics/undergraduate/calendar/current/sec11.html

(Ten) QUIZZES (total 8%; 0.8% each x 10 = 8%). Quiz deadlines are at 10:15AM of the day indicated in the calendar (previous page). Deadlines always fall on a Thursday. They will be posted on Moodle the Tuesday prior to the deadline at 10:15AM. You have then 48h in total to complete each Quiz. No excuse for delays other than medical is accepted.

(Three) REPORTS (total 21%; 7% each x 3 = 21%). Reports are due on report 1) Oct. 6; report 2) Nov. 3 and report 3) Nov 24. Reports will be posted in Moodle two weeks prior to their deadlines. They should be sent in a word file (or pdf) to your TA on the day of their deadline by 10:15AM. Reports will be produced using R (the statistical software used in BIOL322 and learned during lab tutorials).

If an excused issue (example: illness) is incurred, an extension for the report may be granted by the instructor (Dr. Peres-Neto and not the TA's). Such extensions are expected to be requested at least 24 hours before the report is due (TIP - avoid start working on the report too close to the deadline). You must send a written request to Dr. Peres-Neto via Moodle for an extension. Official notes such as medical notes will be then requested. The following grading penalties will be applied to late reports: 1 day or less - 10%; 1-2 days - 20%; 2-3 days - 35%; 3-4 days - 50%; 4-5 days - 70%; more than 5 days - 90%.

(Two) MIDTERM TIMED EXAMS (total 30%; 15% each x 2 = 10%). Exam 1 is on October 13 and Exam 2 is on November 17. Each midterm will be made available on Moodle at 10:15AM. Students have a total of 115 minutes to complete (10:15 AM until noon). They can be completed in 75 minutes (lecture time) plus an additional 30m are given to deal with potential technical issues. NOTE: Midterms are not cumulative, but the final exam is cumulative. Exams contain questions related to lectures, lab computer tutorials and additional material distributed during the term. No excuse for not taking the exam other than medical is accepted.

(Eleven) TUTORIAL REPORTS (total 11%; 1% each x 11 = 11%). Practicing R and working on tutorial exercises are key to acquire strong skills in biostatistics. R tutorials will be conducted during the lab sections. It is not required that you attend the tutorials via Zoom but you are always required to complete their respective reports. Their deadline is at 10AM of the day after your lab section. No excuse for delay other than medical is accepted.

(ONE) FINAL CUMULATIVE EXAM (total 30%). The exam contain questions related to lectures, computer tutorials and additional material distributed during the term.

EXAMS ARE NOT OPENED BOOK: more details later
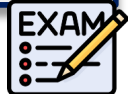
GRADING SCHEME: A+=91-100, A=85-90, A-=80-84, B+=77-79, B=73-76, B-=70-72, C+=67-69, C=63-66, C-=60-62, D+=57-59, D=53-56, D-=50-52, F<50.

MATERIAL USED in the COURSE and for STUDYING for ASSESSMENTS

MANDATORY: Lectures (videos), slides from lectures (may contain more material then the videos), external resources made available to you (e.g., videos, papers, etc), tutorials, reading material produced in our WebBook.

OPTIONAL (but highly recommended) - textbook - The Analysis of Biological Data by Whitlock & Schluter, 3rd edition, W.H. Freeman & Company. Data & resources by chapter: https://whitlockschluter3e.zoology.ubc.ca

Subjects covered in the course

What is statistics and why is it important.

The R statistical environment.

Statistics and samples; the nature of data; types of data and variables; frequency distributions and types of distributions; field versus laboratory studies, experimental versus observational studies.

Displaying data - making effective graphs.

Describing data - descriptive statistics, basic statistical symbols; basic algebra in statistics.

Estimating with uncertainty; samples versus populations; measuring uncertainty; confidence intervals; the normal distribution; inferential statistics.

The concepts of probability, parameters and maximum likelihood.
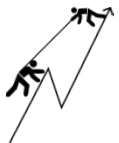
Normal distribution and sampling variation; sampling independence; null distribution; parametric versus non-parametric testing.

Hypothesis testing, inferential statistics and P-values; one sample t-test; type I and II errors; statistical assumptions.

Current views on the usage of P-values.

Two-sample t tests for means with equal and different sample variances; paired t-test; comparing variances; verifying assumptions; data transformation; parametric versus non-parametric testing.

Comparing multiple sample means – single factor Analysis of variance (ANOVA); verifying assumptions.

Comparing means after ANOVA – issues underlying multiple testing and post hoc analysis (Tukey-Kramer method).

Correlation, simple regression, non-linear regression, allometric relationships.

Ranked based - non-parametric statistics.

Designing experiments.

Permutation tests.

RIGHTS AND RESPONSABILITIES – PLAGIARISM & ACADEMIC INTEGRITY

PLAGIARISM: The most common offense under the Academic Code of Conduct is plagiarism which the Code defines as "the presentation of the work of another person as one's own or without proper acknowledgement." This could be material copied word for word from books, journals, internet sites, professor's course notes, etc. It could be material that is paraphrased but closely resembles the original source. It could be the work of a fellow student, for example, an answer on a quiz, data for a lab report, a paper or assignment completed by another student. It might be a paper purchased through one of the many available sources. Plagiarism does not refer to words alone - it can also refer to copying images, graphs, tables, and ideas. "Presentation" is not limited to written work. It also includes oral presentations, computer assignments and artistic works. Finally, if you translate the work of another person into French or English and do not cite the source, this is also plagiarism. In simple words: DO NOT COPY, PARAPHRASE OR TRANSLATE ANYTHING FROM ANYWHERE WITHOUT SAYING FROM WHERE YOU OBTAINED IT!
Source: https://www.concordia.ca/students/academic-integrity.html

ACADEMIC INTEGRITY: What you can and can't do on assignments and exams? watch this Concordia video: https://www.concordia.ca/cunews/main/stories/back-to-school/video-what-is-academic-integrity.html