Statistics for Life Sciences   MAT150 B,C

<div align="right">**Fall 2023**</div>

Course Information

Course:	MAT 150 B,C − Statistics for Life Sciences
Meets:	Section B: Monday, Thursday 12:30 - 1:50 Decary 336
	Section C: Monday, Thursday 2:00 - 3:20 Decary 336
Prerequisites:	LAC 022 or SAS 022 or UL4 mathematics placement
Text:	*OpenIntro Statistics*, 4ed, D. Diez, M. Cetinkaya-Rundel, C. Barr,
	Creative Commons, freely available: `https://leanpub.com/os`
	(select "The Book" only, set price to zero (or contribute) and download pdf)
Supplementary text:	*Introduction to Modern Statistics*, M. Cetinkaya-Rundel, J. Hardin,
	Creative Commons, free web based: https://openintro-ims.netlify.app/index.html
Course Website:	Brightspace `https://brightspace.une.edu/d2l/home/59742`

Instructor Information

Name:	Michael Arciero
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Email:	`marciero@une.edu`
Zoom:	https://une.zoom.us/j/3207739319
Office Hours:	Availability Mon, Wed 9:30 - 11:30
	and by appointment. *Please let me know in advance via email if you plan to attend office hours.*

Course description

In this course, students apply principles of research design and statistics to analyze and interpret data and draw conclusions about experimental situations relevant to the sciences. Topics include random sampling, graphic and numeric descriptive data analysis, the normal distribution, hypothesis testing, t-tests, analysis of variance, correlation, and regression. Students will use statistical software to examine data graphically and perform statistical analyses.

Learning outcomes

At the conclusion of this course students will be able to:

- Distinguish among different types of data.

- Describe a variety of random sampling methods.

- Summarize data verbally, numerically, symbolically, and/or graphically to effectively communicate the results of data analysis.

- Perform inferential hypothesis testing, including t-tests, analysis of variance, correlation, and regression.

- Recognize some sources of bias and limitations of statistical analysis and inferences.

Course in the Curriculum

This course is part of the Core Curriculum that is taken by UNE undergraduates and provides a foundation in key themes in the liberal arts. It addresses the Mathematics component of the Core Curriculum and the following learning outcomes:

- Apply mathematical reasoning to formulate and solve problems in mathematics and other disciplines,

- Interpret mathematical information and draw informed conclusions, and

- Communicate mathematically using symbolic, numerical, and graphical representa- tions.

Brightspace

The course will be run through Brightspace. You will upload lab homework assignments and post discussion content in Brightspace. Course notes, outlines, weekly to do lists, and other resources will also be posted to Brightspace, as will your grades.

Computational tools

Statistics in real world applications requires statistical software. We will use the R statistical software for most of our computations and analysis. *No prior experience with statistical software or programming is required or assumed.* You will gain familiarity with R through interactive tutorials on the web. Additionally, you will complete lab assignments that require you to work directly with R.

You can access R through a cloud based platform, Posit Cloud (`https://posit.cloud/`), where you can register for a free account. Alternatively, you can download and install R onto your personal machine from `https://cran.r-project.org/`. Make sure to download the version for your computer (note that newer Macs with M1 chip require the arm64 version) and install like you would other software - by simply clicking on the downloaded installation file. You will also need to download RStudio, which is a workspace environment that we will use for using R, creating documents, and managing your work. (RStudio comes automatically with the Posit Cloud version of R), You can download RStudio at `https://posit.co/downloads/`. You should download and install R first, before installing RStudio. See the videos linked below for step by step instruction.

I recommend installing on your machine if that is possible, but either of these options is acceptable, and you can even do both. One advantage of the Posit Cloud version is that you can use it with chromebook type devices. Of course, you will need an internet connection to use it.
These videos step you through the processs for installing on a personal machine:
For Mac: `https://www.youtube.com/watch?v=AEebOXiMyyI`
For Windows: `https://www.youtube.com/watch?v=rHZ9MGWxU5I&t=0s`

You should either install R and RStudio on your machine or register on Posit Cloud, before our first class.

We will use R often in the classroom, so you should bring a laptop or device to class. (Chromebooks work but tablet devices are not so great. You really need a keyboard.) **If you do not have access to a personal machine or device please let me know as soon as possible so that we can try to make arrangements for a loaner machine.**

My Open Math

We will make use of a companion site for homework assignments and exams called My Open Math. You will need to register at `https://www.myopenmath.com`. Register as a student using the course ID: TBA and enrollment key: TBA. Use your UNE email to register. **Do this before our first class.**

Homework

Homework will be assigned weekly and completed on the companion My Open Math homework site (see above). Additionally, there will be a number of R Lab assignments. These will be assigned on Brightspace and involve using R/Rstudio to for statistical analyses and to create nice report style documents, which you will submit on Brightspace.

R Labs

There will be several R labs completed in RStudio. Instructions for creating your homework document and generating a pdf will be provided on Brightspace and in class. You will upload these lab assignments to Brightspace.

Participation/Discussions

Part of your grade will be based on your contributions in class with questions and comments, d on discussion topics posted periodically on Brightspace. I will facilitate these by posting a discussion prompt, and you will post and respond to other posts on the site. You can also use the discussion board to ask questions or initiate discussion topics.

Exams

There will be two exams- a midterm and a final exam.

Attendance

Attendance is very important in this class, as there will be a lot of hands on examples and problem solving using the computer, as well as discussion. You are allowed two undocumented absences without it impacting your grade. After that there will be a 2% deduction from your final grade for every undocumented absence.

Course evaluation-Grading

Your grade will be assessed as a weighted average based on the following items:

Homework	35%
R Labs	25%
Mid term	15 %
Final Exam	15 %
Participation/Discussions	10 %

Schedule of topics

Week of	Text Section	Topics
Aug 28	1.1	Case studies, examples
Sept 4	1.2	Data basics:
	1.2	Types of variables
Sept 11	1.2 (cont)	Relationships between variables
	1.3	Sampling principles and strategies
	1.4	Experiments
Sept 18	2.1	Examining numerical data
	2.2	Considering categorical data
	2.3	Case study
Sept 25	3.1	Defining probability
	3.2	Conditional probability*
Oct 2	3.4	Random variables
	3.5	Continuous distributions*
Oct 9	4.1	Normal distribution
	4.3	Binomial distribution*
Oct 16		Exam 1 and review
Oct 23	5.1	Point estimates and sampling variability
	5.2	Confidence intervals for a proportion
	5.3	Hypothesis testing for a proportion
Oct 30	6.1	Inference for a single proportion
	6.2	Difference of two proportions
Nov 6	7.1	One-sample means with the t-distribution
		(no class Nov 9)
Nov 13	7.2	Paired data
	7.3	Difference of two means
	7.4	Power calculations for difference of two means
Nov 20	7.5	Comparing many means with ANOVA
Nov 27	7.5	ANOVA
	8.1	Fitting a line, residuals, and correlation
Dec 4	8.2	Least squares regression
		Review
Dec 11		Final Exam TBA

UNE Academic Policies and College of Arts and Sciences Policies and Student Information

See https://www.une.edu/catalog/2023-2024/undergraduate-catalog/academic-policy-regulations for general university undergraduate policies.

COLLEGE OF ARTS AND SCIENCES GRADING SCHEMA

A	93.0-100%
A-	90.0-92.9%
B+	87.0-89.9%
B	83.0-86.9%
B-	80.0-82.9%
C+	77.0-79.9%
C	73.0-76.9%
C-	70.0-72.9%
D	60.0-69.9%
F	<60%

ACADEMIC INTEGRITY

THE UNE STUDENT HANDBOOK STATES:
The University of New England values academic integrity in all aspects of the educational experience. Academic misconduct in any form undermines this standard and devalues the original contributions of others. It is the responsibility of all members of the university community to actively uphold the integrity of the academy; failure to act, for any reason, is not acceptable.
Charges of academic misconduct will be reviewed by the Dean of the appropriate College and, if upheld, will result at minimum in a failing grade on the assignment and a maximum of dismissal from the University of New England. (UNE Student Handbook, 2023, p. 59).
Academic misconduct includes, but is not limited to:
a. Cheating:
1. Copying from another individual's academic work, test, quiz, or other assignment.
2. Receiving, providing, and/or seeking assistance/aid from another individual to complete academic work, test, quiz, or other assignment.
3. The use of materials or devices during academic work, test, quiz, or other assignment which are not authorized.
4. Possession or use of current or previous course materials without the instructor's permission.
5. Obtaining, or coercing another person to obtain, an unadministered test, test key, homework solution or computer program/software.
6. Substituting for another person, or permitting another person to substitute for oneself, to complete academic work.
7. Uploading, downloading, or accessing complete or incomplete academic work, test, quiz, or other assignment without the prior approval of the instructor.
8. Falsifying research data, laboratory reports, and/or other academic work offered for credit.
9. Altering and/or destroying the work of another student.
10. Failing to comply with instructions given by the person administering the academic work, test, quiz, or other assignment that results in academic misconduct not enumerated above.

b. Plagiarism/Self-Plagiarism:
    1. The representation of words, ideas, illustrations, structure, computer code, other expression, or media of another as one's own and/or failing to properly cite direct, paraphrased, or summarized materials.
    2. The submission of the same academic work more than once without the prior permission of the instructor and/or failure to correctly cite previous work written by the same student.

c. Collusion
    Any unauthorized collaboration or attempted collaboration with another individual to complete academic work, test, quiz, or other assignment that results in similarities in the work, including, but not limited, to providing unauthorized assistance to another student and/or allowing another student access to completed academic work.

d. Falsifying Academic Records
    Altering or assisting in the altering of any official record of the University and/or submitting false information. Omitting requested information that is required for, or related to, any official record of the University.

e. Misrepresenting Facts
    1. Providing false grades or falsifying other academic information.
    2. Providing false or misleading information in an effort to injure another student academically.
    3. Providing false or misleading information in an effort to receive credit for attendance or a postponement or an extension on academic work, test, quiz, other assignment.

f. Violation of Professional Standards
    Any act or attempted act that violates specific Professional Standards or a published Code of Ethics. NOTE: Students are held accountable under this policy based on their college or school of enrollment, declared major, degree program, and/or pre-professional program.

g. Unfair Academic Advantage
    Any other action or attempted action that may result in creating an unfair academic advantage for oneself or may result in creating an unfair academic advantage or disadvantage for another student that is not enumerated in items a-f above.

The College of Arts and Sciences policy on reviewing alleged acts of academic misconduct can be found at: https://www.une.edu/cas/academic-policies

MIDTERM ACADEMIC PROGRESS REPORTS

The University of New England is committed to the academic success of its students. At the midterm of each semester, instructors will report the performance of each student as SATISFACTORY (S) or UNSATISFACTORY (U). Instructors will announce when these midterm academic progress reports will be available for viewing via U-online. This early alert system gives all students important information about progress in their courses. Students who receive an UNSATISFACTORY midterm report should take immediate action by speaking with their instructor to discuss suggestions for improvement such as utilizing the services of academic advising, the Student Academic Success Center, Counseling Services, and Residential Education.

STUDENT ACADEMIC SUCCESS CENTER (SASC)

The Student Academic Success Center offers a range of free services to support your academic achievement, including tutoring, writing support, digital project support for ePortfolio, test-prep and studying strategies, learning consultations, and many online resources. To see and schedule available appointments go to https://une.tutortrac.com or visit the SASC. To access our online resources, including links, guides, and video tutorials, visit https://une1.sharepoint.com/sites/SASC.

STUDENTS WITH DISABILITIES

The University of New England is committed to creating a learning environment that meets the needs of its diverse student body and will make reasonable accommodations for students with qualified disabilities. Any student eligible for and needing academic adjustments or accommodations because of a disability is encouraged to request accommodations through the UNE Student Access Center. Registration with the Student Access Center is required before accommodation requests can be granted. Visit https://www.une.edu/student-access-center for more information.