Biostatistics for Biology Majors (BIOL 214) syllabus.

Summer 2025

$$f(y) = \frac{1}{\sigma\sqrt{2\pi}} \; e^{-\frac{1}{2}\left(\frac{y-\mu}{\sigma}\right)^2}$$

I. Basic course information:

Lecture instructor:

M/W evening class: Arndt F. Laemmerzahl, *alaemmer@gmu.edu*

Course coordinator: Arndt F. Laemmerzahl

Email: *alaemmer@gmu.edu*. ***The best way of getting in touch.***

Office hours and contact information: please see the link for contact information on the course web page:

http://mason.gmu.edu/~alaemmer/bio214/main.html

This page will have homework assignments and other useful information posted. It also has lecture notes as well as a text based on the lecture notes.

II. Books, manuals, etc.

Text: There is no text to purchase for Biology 214. Instead, we will use the text available on the course web page. There are also lecture notes on the web page, but these are slowly getting out of date (the text is regularly updated).

Note *that if you wish to use the notes/text on the exams, you will need to print them off (sorry!).*

The only electronic device you are allowed to use on exams is a calculator.

No tablets, no computers, no phones, no watches, etc.

Software: R statistical software - available at http://www.r-project.org/

This is open source software and is free. It is also better than most other non-free statistical software, and is available for Windows, Mac-OS, and Linux.

Please follow the instructions on the course web page to install this software.

Instructions for using R will be available during lecture, recitation, and through the notes.

Note that R can be a bit of a pain to use until you get used to it. Nevertheless, you will be required to learn R. *Important: despite what some people say,* ***Excel is NOT a statistical package*** *and you are not allowed to use Excel for any actual analyses.*

We will also be using RStudio (https://posit.co/downloads/); this is a convenient interface for R. The free version is more than powerful enough (the paid version is for large corporations that need extra support).

Calculator: You will need a calculator that has statistical functions.

Chances are that if you own a "fancier" (e.g. scientific) calculator it will include these functions. There are some TI's available for under $20.00 that will do (try the TI-30X IIS). I'm not endorsing TI, I just happen to know that model will do everything you need. You can use whatever brand you wish, but it is *your responsibility* to figure out how it works.

You can not use your phones on exams, so yes, you do need a separate calculator.

III. Exams (and quizzes):

Two regular exams and a final (but see comment on quizzes). Your lower regular exam will count for 15% of your grade, your higher regular exam will count for 30% of your grade. Please note that ***there is no possibility of a makeup exam under <u>any</u> circumstances****. The final is worth 25% of your grade

(*In case of a <u>real emergency</u> you must let your instructor know before the exam or <u>no later than 12 hours after the exam.</u>)

Exam I: Wednesday, June 12th (may move up or back a day).
Exam II: Monday, July 3rd (may move up or back a day).

Note: You will have 1 hour and 15 minutes for the exams. Exams will take place at the beginning of class using Canvas - see below.

Final exam: Wednesday, July 16th.

Some comments on exam structure:

Exams will be ***entirely open book and multiple choice***.

You will need to take the exams on Canvas using honorlock (***you will need a camera***).

The exam will be timed and will take place at the beginning of our scheduled class; after class we will have lecture.

You will have no opportunity to "back up" and fix mistakes, so please be careful with your answers.

Do make make sure you know how your calculator works.

Generally, exams are not cumulative, but you may need to know some of the material covered by a previous exam to understand the material on the current exam. This is particularly true of the final, which is also partly cumulative.

IV. Homework & Recitation.

Recitation is an important part of the course, and is worth 30% of your grade. It is an opportunity for you to ask questions, get personal attention, and learn how to use statistical software. Recitation has two main parts, and a few minor parts:

0) All recitations will be live and on-line via zoom at the day/time your section is scheduled for.

1) You will be given a math assessment on the first day of recitation. Please do the best you can - it's designed to let you know if you need help with basic mathematical principles. This is worth 1% of your grade.

2) You will be given homework assignments twice each week (Mondays and Wednesdays). All problems will need to be completed by the following recitation. About half of these will be discussed in class (via zoom), the other half will be handed in and graded. You will not know which are which. ***Each student will lead at least two homework discussions during the course of the semester.*** You will be selected at random to lead a discussion.

Depending on the size of your recitation section and other factors, you may need to lead more than two homework discussions.

3) ***If you are not present when you are called up for your presentation, you will get a "0" for your presentation.***

4) Late homework assignments are penalized as follows:

On time: **full points/credit** possible (each homework is worth 2 points (= 2 %)).

Late:	Same day:	**-0.5 points.**
	Following day until the start of the following recitation:	**-1.0 points**.
	During the following recitation:	**-1.5 points.**
	After the following recitation:	***0 points.***

Exception: the last homework assignment must be handed in on time or you will get no credit.

Warning: all outstanding/incomplete assignments involving recitation must be resolved by your last day of recitation. No exceptions.

Your instructor may make exceptions for unusual or unforeseen circumstances, but it is your responsibility to contact your instructor about this.

5) Other comments about homework:

E-mailed homework will not be accepted - you must submit your homework through Canvas as instructed.

6) The remainder of your time in recitation is an opportunity to use/discuss R. As the semester progresses you will need to make use of R to solve homework problems. If you do not know how to use R, you will not be able to do all the problems. ***Not knowing how to use R (or claiming "R is not working") is NOT an excuse for failing to do homework assignments.***

7) Your recitation instructor will provide you with more details about recitation.

8) Copying answers from other students or from previous classes is a violation of the honor code (see below)! We are well aware of sites like ChatCPT or Chegg (which is now almost dead). Please don't do anything stupid.

9) To summarize, grading for recitation is as follows:

1 math assessment (in class)	= 1%
12 homework assignments at 2% each	= 24%
2 - 4 presentations (depending on class size)	= 5% overall
Total	= 30% of your grade in Biology 214

V. Grading

Your final grade will be based on your percent out of 100. The following grading scale will be used:

96-100 = A+	90 - 95 = A	86 - 89 = B+	80 - 85 = B
76 - 79 = C+	70 - 75 = C	60 - 69 = D	0 - 59 = F

You will notice that (−) grades are not used.

VI. Miscellaneous

Honor code: if you are caught cheating, you will be taken to the honor committee. No arguments. Although quite rare, they have expelled people for a first offense. Cheating has skyrocketed in the last few years - but many students have been caught as well. Please don't cheat - ***it goes on your record!***

You are responsible for information and announcements presented in class and/or through e-mail. Not being in class or not checking your e-mail is not an excuse. Make sure your GMU e-mail is working - this is *your* responsibility!

Please do not be disruptive in class. No one is forcing you to be in class. If you want to have a conversation, use your phone, etc., please do it outside of class or you may be asked to leave.

Missed class: if for some reason class is canceled, then the following class will cover the material for the missed class. This is particularly important should an exam day be canceled for whatever reason (the exam will take place during our next scheduled class).

Comment on summer classes: Summer classes are intense and move fast. Although the B session is not quite as bad as the others, you will probably still not do well if you are taking more than one class at a time, or have a heavy load at work. Please keep this in mind.

If you are having problems please see your instructor. Your instructor is here to help you learn this material ***and*** help you pass this class. They will do what they can to make sure that you make it through this class successfully. *Please don't wait too long if you are having difficulties.*

Finally, please try to be in class. ***Classes are NOT recorded.*** You've probably heard it many times already, but it's particularly true in this class. ***You will almost certainly not do well if you are absent too often.***

VII. Learning outcomes:

- Understand basic measures for central tendency and spread.
- Know the basics of probability.
- Become familiar with some vary basic distributions.
- Be able to construct and interpret confidence intervals.
- Be able to carry out basic hypothesis tests such as various T-tests, MWU-tests, χ^2, etc.
- Understand the basics of correlation and regression.
- Understand basic concepts such as p-values, power, types of error, α, β, etc.

VIII. Tentative course outline (may change as the semester progresses)**:**

Date	***Lecture topic (and chapter number)***	***Recitation topic***
May 28	Introduction (chapter 1) Data organization (chapter 3)	Introduction Math assessment
June 2	Descriptive statistics (chapter 4) Samples and populations (chapter 5)	Installing R Measuring experiment
June 4	Probability (chapter 6) Conditional probability (chapter 6) Binomial distribution (chapter 6)	Homework discussion
June 9	Normal distribution (chapter 7) Other distributions (chapter 8) Review	Homework discussion
June 11	**EXAM I** Parameters and estimates (chapter 8) Sampling distributions (chapter 9)	Homework discussion
June 16	Confidence intervals (chapter 10) One sample t-test / hypothesis tests (chapter 11)	Homework discussion
June 18	One sample t-test / hypothesis tests (chapter 11) Two sample tests (chapter 12)	Homework discussion
June 23	Assumptions (chapter 13) MWU test (chapter 14)	Homework discussion
June 25	Paired tests (chapter 15) One sided tests (chapter 16) Review	Homework discussion
June 30	**EXAM II** Goodness of fit tests (chapter 17)	Homework discussion
July 2	Contingency table tests (chapter 18)	Homework discussion
July 7	Correlation (chapter 19)	Homework discussion
July 9	Regression (chapter 20)	Homework discussion
July 14	Review	Homework discussion
July 16	**FINAL EXAM**	

Note:

Officially, the final is scheduled for Friday, July 25th, but the university gave us enough extra lecture days that we will easily get done by Wednesday July 16th. As such, we'll have our final on the 16th and finish 9 days early.

VIII. Information that applies to all classes at GMU:

(Some of this is repetitive, but important. It applies to ***all*** your classes at GMU.)

Academic integrity

GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit to those people in the proper, accepted form. When doing homework, the work must be yours. It is totally unacceptable to copy the work of another student in this course in any form.

GMU email accounts

Students must use their Mason email accounts—either the existing "MEMO" system or a new "MASONLIVE" account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information.

USEFUL CAMPUS RESOURCES:

Writing center:

A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu

University libraries ("Ask a Librarian")

http://library.gmu.edu/mudge/IM/IMRef.html

Counseling and psychological services (CAPS):

(703) 993-2380;
http://caps.gmu.edu

University policies:

The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.

Disability Resource Center

If you are a student with a disability and you need academic accommodations, please contact the Disability Resource Center (DRC) at 703-993-2474. All academic accommodations must be arranged through that office.