



THE GEORGE
WASHINGTON
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Course Syllabus
STAT 1127: Statistics for the Biological Sciences
Fall Semester – 2023
Tuesday and Thursday, 6:10pm to 7:25pm
Funger Hall 210

Course Title: Statistics for the Biological Sciences

Course Number: STAT 1127, Section 11

Meets: Tuesday and Thursday: 6:10pm-7:25pm in Funger Hall 210

Instructor: James Hunt. E-mail: jhunt@gwu.edu **Teaching Assistant:** TBD

Office Hours: By appointment - times will be arranged as needed. I will usually be available before and after class. I will also respond to questions sent by e-mail. I usually will check emails in the evening during the week and once over the weekend.

Required Materials:

- Textbook: Shahbaba, Biostatistics with R, (ISBN 13: 978-1461413011)
- Laptop or Desktop computer with web browser (Google Chrome is recommended), webcam, microphone, and speaker
- Calculator: Texas Instruments (TI) 83 or 84 series calculator recommended
- Software: R: <https://www.r-project.org/>
R Studio: <https://www.rstudio.com/products/rstudio/download/>

Blackboard: Class lectures will be presented in person during the scheduled class time. Office hours will be conducted through Blackboard Collaborate Ultra. I will be posting all course

materials on Blackboard. This includes lecture notes, homework assignments, announcements, and updates. Students are strongly encouraged to check Blackboard prior to coming to class. Quizzes and exams will be in class.

Course Prerequisites: This course does not require any background in calculus. However, students who enrolled in this course are required to have basic knowledge in Algebra and Arithmetic.

Course Description: This is an introductory course in statistical sciences applicable to biomedical and related sciences using R. The topics include introduction to numerical measures of central tendency and variability, frequency distributions & graphical presentations, probability, random variables, properties of basic probability distributions, sampling distributions, estimation, confidence intervals, testing of hypotheses, linear regression and correlation.

Learning Outcomes: As a result of completing this course, students will be able to:

- Apply laws of probability
- Apply descriptive statistics to data
- Construct and interpret confidence intervals
- Evaluate evidence for and against hypotheses using statistical tests
- Find the least-squares equation for simple linear regression and assess the utility of the model.
- Use basic Excel and R functions to do statistical analysis

Discussion/Lab: There is no recitation section scheduled for this class.

Homework Assignments: Daily assignments will be made from the textbook. It is your responsibility to complete your homework assignments prior to coming to class. I will not collect these assignments for grading. However, students are strongly encouraged to complete all these assignments for practice purposes.

Quizzes: There will be 10 quizzes during the semester. There are no makeup quizzes. I will drop your lowest quiz score. Quizzes will be presented in person during class time.

Examinations: There will be a midterm exam and a final exam during the semester. There are no make-up exams nor test corrections. *See Make-up Work for details.* Midterm and final exams will be available in person during class. Please do not ask your instructor to change the manner in which the midterm and final are administered.

- Midterm: Thursday, October 19 at 6:10pm (tentative).
- Final: Week of December 13 - 19 (time/date to be announced later).

Project: A project will be posted on Blackboard in mid-October to be completed by Thursday, November 16. This project is intended to give the student first-hand experience in using the ideas of basic statistics to perform a preliminary analysis of data. You must use R or Excel for all computations. The final report requires outlines of your approach, methodology analysis, test statistic, formulas performed, etc. The final report should contain sections, paragraphs, graphs, and no misspelled words. This will be a group project with teams of 3 people.

Make-up Work: No late quizzes will be available (unless for serious reasons with documentation). The lowest quiz score will be dropped. If there is a need to attend a class with a quiz asynchronously, please contact me in advance and plan. No early or make-up exams (unless for serious reasons with documentation).

Attendance and Class Participation:

Students are expected to attend every class. Students are responsible for all material covered in class whether they are present during the lecture or not. Students who miss class should review the recorded lectures available through Blackboard. All students are expected to take notes during class. Taking detailed, comprehensive notes is necessary. At a minimum, you should take down everything written on the board. The course curriculum is extensive and class time is not available to repeat lecture material for students who missed class. If you missed a class, it is your responsibility to learn the material and for making up all course work missed during an absence. In most cases, regular classroom attendance and regular participation is essential. *All recorded lectures, slides, and lecture materials are available only for student use in this course, STAT 1127 (Fall 2023). Do not duplicate or distribute without written consent from James Hunt.*

Average Minimum Amount of Independent, Out-of-Class, Learning Expected per Week:

The George Washington University has established an average minimum amount of direct in-class instruction, and independent, out-of-class, learning expected per week. For example, a 15-week semester, including exam week, students taking a 3-credit course are expected to spend a minimum of 7.5 hours per week, including 2.5 hours of classroom instruction and a minimum of 5 hours of out-of-class work.

Grading rationale:

<u>Element</u>	<u>Percent of Total Grade</u>
Project	10%
Quizzes	20%
Midterm	35%
Final	35%

Final grades will be assigned based on the following scale:

A = 94% to 100%	C = 74% to 76%
A- = 90% to 93%	C- = 70% to 73%
B+ = 87% to 89%	D+ = 67% to 69%
B = 84% to 86%	D = 64% to 66%
B- = 80% to 83%	D- = 60% to 63%
C+ = 77% to 79%	F < 60%

Academic Integrity: Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For details and complete code, see: studentconduct.gwu.edu/code-academic-integrity

University Policy:

- **Religious Observance:** In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: students.gwu.edu/accommodations-religious-holidays.
- **Incomplete Grades:** At the option of the instructor, the symbol "I" may be recorded if a student is unable to complete the work, and if the instructor is informed of and approves the reasons before the date when the grade must be reported. The course work must be completed within a designated time period agreed upon by the instructor and the student.

Safety and Security: In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

Support for students outside the classroom

- **Disability Support Services (DSS):** Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see: disabilitysupport.gwu.edu/
- **Mental Health Services 202-994-5300:** The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. For additional information see: counselingcenter.gwu.edu/
- **Title IX:** The George Washington University (GW) and its faculty are committed to creating a safe and open learning environment for all students. If you or someone you know has experienced sexual harassment, including sexual assault, dating or domestic violence, and stalking, please know that help and support are available. GW strongly encourages all members of the community to take action, seek support, and report incidents of sexual harassment to the Title IX Office. You may contact the Title IX Office at 202-994-7434 or at titleix@gwu.edu or learn more by visiting titleix.gwu.edu. Please be aware that faculty members are required to disclose information about suspected or alleged sexual harassment or other potential violations of the Title IX Sexual Harassment and Related Conduct Policy to the Title IX Office. If the Title IX Office receives information about an incident, they will reach out to offer information about resources, rights, and procedural options as a member of the campus community. Community members are not required to respond to this outreach. If you, or another student you know, wishes to speak to a confidential resource who does not have this reporting responsibility, please contact Counseling and Psychological Services through the Colonial Health Center 24/7 at 202-994-5300, or the Office Of Advocacy and Support at 202-994-0443 or at oas@gwu.edu.

Student/Instructor Communication Mode: Students are **strongly encouraged** to communicate with the instructor regarding any questions or concerns that you may have. When you have finished reading this syllabus, please send me an email with a picture of your favorite super hero. Successful learning requires good communication between students and the instructor. If, for any reason, you did not ask question(s) in class, feel free to see me during my office hours or send me an e-mail.

Tentative Schedule for Stat 1127- Fall 2023

* The instructor reserves the right to modify as needed.

Lecture #	Date	Sections	Topics
1	Thursday 8/24	Introduction: Class Syllabus, R Introduction	❖ R Introduction
2	Tuesday 8/29	Chapter 1	❖ Terminology ❖ Sampling and related problems
3	Thursday 8/31	Chapter 2: Data Exploration	❖ Methods for describing sets of data
4	Tuesday 9/5	Chapter 2 continued Quiz #1	❖ Using the mean and standard deviation to describe the data
5	Thursday 9/7	Chapter 2 continued	❖ Detecting outliers using Box plots and z-Score
6	Tuesday 9/12	Chapter 4: Probability Quiz #2	❖ Introduction to probability
7	Thursday 9/14	Chapter 4 continued	❖ Conditional probability, Independence events, Bayes's Rule
8	Tuesday 9/19	Chapter 5: Random Variables and Probability Distributions Quiz #3	❖ Types of Random Variables ❖ Probability Distributions for Discrete Random Variables
9	Thursday 9/21	Chapter 5 continued	❖ Binomial Random Variable ❖ Poison Random Variable ❖ Hypergeometric Random Variable

10	Tuesday 9/26	Chapter 5 continued Quiz #4	<ul style="list-style-type: none"> ❖ Continuous Probability Distribution ❖ Normal Distribution
11	Thursday 9/28	Chapter 5 continued	<ul style="list-style-type: none"> ❖ Uniform Distribution ❖ Exponential Distribution
12	Tuesday 10/3	Chapter 6: Estimation Quiz #5	<ul style="list-style-type: none"> ❖ Concept of a Sampling Distribution ❖ Properties of Sampling Distributions ❖ Central Limit Theorem
13	Thursday 10/5	Chapter 6 continued	<ul style="list-style-type: none"> ❖ Identifying and Estimating the Target Parameter ❖ Confidence Interval for Population Mean
14	Tuesday 10/10	Chapter 6 continued Quiz #6	<ul style="list-style-type: none"> ❖ Large Sample Confidence Interval for Population Proportion Determining Sample Size
	Thursday 10/12	No Class – Fall Break	
	Tuesday 10/17	Review for Midterm	
	Thursday 10/19	MIDTERM	
	Tuesday 10/24	Midterm Recap Project Introduction	
15	Thursday 10/26	Chapter 7: Hypothesis Testing	<ul style="list-style-type: none"> ❖ Hypothesis Testing
16	Tuesday 10/31	Chapter 7 continued	<ul style="list-style-type: none"> ❖ Hypothesis Testing for Means with Small Samples ❖ Hypothesis Testing for Proportions

17	Thursday 11/2	Chapter 8: Statistical Inference Quiz #7	❖ Comparing Two Population Means
18	Tuesday 11/7	Chapter 8 continued	❖ Comparing Two Population Means ❖ Paired Difference Experiments
19	Thursday 11/9	Chapter 8 continued Quiz # 8	❖ Comparing Two Population Proportions ❖ Determining the Sample Size
20	Tuesday 11/14	Chapter 10: Analysis of Categorical Variables	❖ Categorical Data Analysis ❖ Multinomial Experiments ❖ Chi-Square Tests
21	Thursday 11/16	Chapter 10 continued Projects Due	❖ Chi-Square Tests (Two-Way Tables)
	Tuesday 11/21	No Class – Thanksgiving Break	
	Thursday 11/23	No Class – Thanksgiving Break	
22	Tuesday 11/28	Chapter 11: Regression Analysis Quiz # 9	❖ Simple Linear Regression
23	Thursday 11/30	Chapter 11 continued	❖ Model Assumptions ❖ Assessing the Utility of the Model
24	Tuesday 12/5	Chapter 11 continued Quiz #10	❖ Coefficients of Correlation and Determination ❖ Using the Model for Estimation and Prediction ❖ A Complete Example

	Thursday 12/7	Review for Final	
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- **The final exam will be during December 13 - 19 with the exact time/date to be announced later.**