

The George Washington University
Department of Statistics
Syllabus: Statistics 1127 (Statistics for Biological Sciences)

Course: STAT 1127-10, Spring 2025
Time: Monday & Wednesday, 6:10 PM-7:25 PM
Location: FNCR 220
Instructor: Prof. Reza Modarres
E-mail address: reza@gwu.edu
Office hours: Wednesday 5-6 PM, 760 B Rome Hall

TEXT book: Biostatistics: A Foundation for Analysis in the Health Sciences, 11th Edition
Wayne W. Daniel, Chad L. Cross, ISBN: 978-1-119-28237-2

R Software (free): R: <https://www.r-project.org/>
R Studio: <https://www.rstudio.com/products/rstudio/download/>

TA/Grader: Yawen Wu

TA Office hours and Location: yawen@gwmail.gwu.edu

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:

At the end of the semester, you should be able to

- 1) apply laws of probability and use various probability distributions
- 2) construct and interpret tests and confidence intervals
- 3) apply simple linear regression, evaluate the models and interpret the results
- 4) use basic R functions to do statistical analysis

GRADING: All exams and quizzes are **open book (not notes)** and given in class. Final grade will be based on

- Quizzes : 30%,
- Midterm Examination: 30%,
- Course Project: 10%,
- Final Examination: 30%,

Quizzes: There will be six (biweekly) quizzes, three in-class and three take-home. The lowest two scores are dropped. If you miss a quiz or its due date (for any reason), a zero is recorded for your grade.

Course Project: The course project instructions will be posted to Blackboard by the end of March. . A *hard copy* of the report and completed course project is due *in class*. See the course calendar. You may work in groups of up to three students.

Students should expect to spend approximately 2.5 hours per week on direct instruction (class time) and 5 hours per week on independent learning (assignments, studying, and independent learning activities). Stat 1051,

1053, 1091, 1111, and 1127 are related in their subject matter, and credit for only one of them may be applied toward a degree.

Course Policies:

- Regular class attendance.
- No late work is accepted.
- No make-up examinations (unless for serious reasons with documentation).
- Lectures are uploaded on the Blackboard System (<http://blackboard.gwu.edu/>) every week.

University policies

Academic Integrity Code

Academic integrity is an essential part of the educational process, and all members of the GW community take these matters very seriously. As the instructor of record for this course, my role is to provide clear expectations and uphold them in all assessments. Violations of academic integrity occur when students fail to cite research sources properly, engage in unauthorized collaboration, falsify data, and otherwise violate the [Code of Academic Integrity](#). If you have any questions about whether particular academic practices or resources are permitted, you should ask me for clarification. If you are reported for an academic integrity violation, you should contact Student Rights and Responsibilities (SRR) to learn more about your rights and options in the process. Consequences can range from failure of assignment to expulsion from the University and may include a transcript notation. For more information, refer to the SRR website at studentconduct.gwu.edu/academic-integrity, email rights@gwu.edu, or call 202-994-6757.

University policy on observance of religious holidays

Students must notify faculty during the first week of the semester in which they are enrolled in the course, or as early as possible, but no later than three weeks prior to the absence, of their intention to be absent from class on their day(s) of religious observance. If the holiday falls within the first three weeks of class, the student must inform faculty in the first week of the semester. For details and policy, see provost.gwu.edu/policies-procedures-and-guidelines.

Use of Electronic Course Materials and Class Recordings

Students are encouraged to use electronic course materials, including recorded class sessions, for private personal use in connection with their academic program of study. Electronic course materials and recorded class sessions should not be shared or used for non-course related purposes unless express permission has been granted by the instructor. Students who impermissibly share any electronic course materials are subject to discipline under the Student Code of Conduct. Contact the instructor if you have questions regarding what constitutes permissible or impermissible use of electronic course materials and/or recorded class sessions. Contact Disability Support Services at disabilitysupport.gwu.edu if you have questions or need assistance in accessing electronic course materials.

Academic support

Academic Commons

[Academic Commons](#) is the central location for academic support resources for GW students. To schedule a peer tutoring session for a variety of courses visit go.gwu.edu/tutoring. Visit academiccommons.gwu.edu for study skills tips, finding help with research, and connecting with other campus resources. For questions email academiccommons@gwu.edu.

GW Writing Center

GW Writing Center cultivates confident writers in the University community by facilitating collaborative, critical, and inclusive conversations at all stages of the writing process. Working alongside peer mentors, writers develop strategies to write independently in academic and public settings. Appointments can be booked online at gwu.mywconline.

Support for students in and outside the classroom

Disability Support Services (DSS) 202-994-8250

Any student who may need an accommodation based on the potential impact of a disability should contact Disability Support Services at disabilitysupport.gwu.edu to establish eligibility and to coordinate reasonable accommodations.

Student Health Center 202-994-5300, 24/7

The Student Health Center (SHC) offers [medical](#), [counseling/psychological](#), and [psychiatric](#) services to GW students. More information about the SHC is available at healthcenter.gwu.edu. Students experiencing a medical or mental health emergency on campus should contact GW Emergency Services at 202-994-6111, or off campus at 911.

GW Campus Emergency Information

GW Emergency Services: 202-994-6111

For situation-specific instructions, refer to [GW's Emergency Procedures guide](#).

GW Alert: GW Alert is an emergency notification system that sends alerts to the GW community. GW requests students, faculty, and staff maintain current contact information by logging on to alert.gwu.edu. Alerts are sent via email, text, social media, and other means, including the Guardian app. The Guardian app is a safety app that allows you to communicate quickly with GW Emergency Services, 911, and other resources. Learn more at safety.gwu.edu.

Protective Actions : GW prescribes four protective actions that can be issued by university officials depending on the type of emergency. All GW community members are expected to follow directions according to the specified protective action. The protective actions are Shelter, Evacuate, Secure, and Lockdown (details below). Learn more at safety.gwu.edu/gw-standard-emergency-statuses.

Shelter

- Protection from a specific hazard. The hazard could be a tornado, earthquake, hazardous material spill, or other environmental emergency. Specific safety guidance will be shared on a case-by-case basis.

Action: Follow safety guidance for the hazard.

Evacuate

- Need to move people from one location to another. Students and staff should be prepared to follow specific instructions given by first responders and University officials.

Action: Evacuate to a designated location. Leave belongings behind. Follow additional instructions from first responders.

Secure

- Threat or hazard outside of buildings or around campus. Increased security, secured building perimeter, increased situational awareness, and restricted access to entry doors.

Action: Go inside and stay inside. Activities inside may continue.

Lockdown

- Threat or hazard with the potential to impact individuals inside buildings.
- Room-based protocol that requires locking interior doors, turning off lights, and staying out of sight of corridor window.

Action: Locks, lights, out of sight. Consider Run, Hide, Fight

Topics

Chapter 1: Introduction to Biostatistics

Measurement and Measurement Scales, Sampling And Statistical Inference, The Scientific Method And The Design Of Experiments

Chapter 2: Descriptive Statistics

Grouped Data: The Frequency Distribution, Descriptive Statistics: Measures Of Central Tendency, Descriptive Statistics: Measures Of Dispersion

Chapter 3: Some Basic Probability Concepts

Two views of probability: objective and subjective, elementary properties of probability, calculating the probability of an event, Bayes' theorem

Chapter 4: Probability Distributions

Probability Distributions Of Discrete Variables, The Binomial Distribution, Continuous Probability Distributions, The Normal Distribution, Normal Distribution Applications

Chapter 5: Some Important Sampling Distributions

Sampling Distributions, Distribution of the Sample Mean, Distribution of the Difference Between Two Sample Means, Distribution of the Sample Proportion, Distribution of the Difference Between Two Sample Proportions

Chapter 6: Estimation

Confidence Interval (Ci) For A Population Mean, The T Distribution, CI for the Difference Between Two Population Means, CI For A Population Proportion, CI for the Difference Between Two Population Proportions, Determination Of Sample Size for estimating Means and Proportions

Chapter 7: Hypothesis Testing

Hypothesis Testing: A Single Population Mean, The Difference Between Two Population Means, Paired Comparisons, Single Population Proportion, The Difference Between Two Population Proportions, The Type I error and the power of a test

Chapter 11: Simple Linear Regression and Correlation

Qualitative Independent Variables

Chapter 12: The Chi-Square Distribution and Analysis of Frequencies

The Chi-Square Distribution, Tests of Goodness-of-Fit, Tests of Independence

Spring Semester 2025

First Day of Classes	Monday, January 13, 2025
Martin Luther King Jr. Day (no classes)	Monday, January 20, 2025
Inauguration Day (no classes)	Monday, January 20, 2025
President's Day (no classes)	Monday, February 17, 2025
Spring Break (no classes)	Monday, March 10–Saturday, March 15, 2025
Last Day of Classes	Monday, April 28, 2025
Make-Up Day	Tuesday, April 29, 2025
Designated Monday	Wednesday, April 30, 2025
Reading Days	Thursday, May 1–Friday, May 2, 2025
Final Examinations	Saturday, May 3–Friday, May 9, 2025

Tentative Schedule

Class	Date	Sections	Topics
1	M 1/13	Introduction: Class Syllabus, R Introduction	Chapter 1: What is Statistics? Population and sample
2	W 1/15	Chapter 2: Data Exploration	Chapter 2: Parameter and statistic
	M 1/20	No Class	
3	W 1/22	Chapter 2: Data Exploration	Chapter 2: Methods for describing sets of data
4	M 1/27	Chapter 2 continued Quiz #1 (take-home)	Chapter 2: Measures of center and spread
5	W 1/29	Chapter 2 continued	Detecting outliers using Box plots and z-Score, The Empirical Rule
6	M 2/3	Chapter 3: Probability Quiz #1 due (in class)	Chapter 3: Introduction to probability
7	W 2/5	Chapter 3 continued	Chapter 3: Conditional probability, Independence events
8	M 2/10	Chapter 4: Random Variables and Probability Distributions	Chapter4: Types of Random Variables, Probability Distributions for Discrete Random Variables
9	W 2/12	Chapter 4 continued	Chapter 4: Binomial Random Variables
	M 2/17	No Class	
10	W 2/19	Chapter 4 continued Quiz #2 (in class)	Chapter 4: Continuous Probability Distribution, Normal and Uniform
11	M 2/24	Chapter 5: Sampling Distribution	Chapter 5: Sampling Distribution
12	W 2/26	Chapter 5: Estimation The Central Limit Theorem Quiz #3 (take-home)	Chapter 5: Sampling Distribution Properties of Sampling Distributions
13	M 3/3	Chapter 5: Estimation	Properties of Sampling Distributions. The Central Limit Theorem
14	W 3/5	Chapter 6: Point Estimation Quiz #3 due in class.	Chapter 6: Point Estimation. Confidence Interval (CI) for the Population Mean
	3/10,3/12	No Class – Spring Break	
15	M 3/17	Chapter 6 continued Review for Midterm	Chapter 6: Large Sample CI for Proportion Determining Sample Size

16	W 3/19	MIDTERM	
17	M 3/24	Chapter 7: Hypothesis Testing Midterm Recap	Chapter 7: Hypothesis Testing
18	W 3/26	Chapter 7: Hypothesis Testing Project Introduction	Chapter 7: Hypothesis Testing
19	M 3/31	Chapter 7: Hypothesis Testing	Chapter 7: Hypothesis Testing
20	W 4/2	Chapter 7 continued Quiz #4 (in class)	Chapter 7: Hypothesis Testing for Means with Small Samples and for Proportions
21	M 4/7	Chapter 7: Statistical Inference	Chapter 7: Comparing Two Population Means
22	W 4/9	Chapter 7 continued	Chapter 7: Comparing Two Population Means Paired Difference Experiments
23	M 4/14	Chapter 7 continued Quiz #5 (take-home)	Chapter 7: Comparing Two Population Proportions. Determining the Sample Size
24	W 4/16	Chapter 12: Analysis of Categorical Variables	Chapter 12: Categorical Data Analysis Multinomial Experiments. Chi-Square Tests
25	M 4/21	Chapter 12 continued	Chapter 12: Chi-Square Tests (Two- Way Tables)
26	W 4/23	Chapter 11: Regression Analysis Quiz #5 due in class	Chapter 11: Simple Linear Regression
27	M 4/28	Chapter 11 continued Projects Due	Chapter 11: Model Assumptions Coefficients of Correlation and Determination
28	W 4/30	Chapter 11 continued Quiz #6 in class	Chapter 11: Model Estimation and Prediction
	Final Exam	Final Exam	

NOTE: For the final exam, please see Administration of Final Examinations during the Examination Period (<http://provost.gwu.edu/administration-final-examinations-during-examination-period>).