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

Course: STAT 1127-11, Spring 2024
Time: Monday & Wednesday, 9:35 AM-10:50 AM
Location: COR 204
Instructor: Prof. Reza Modarres
E-mail address: reza@gwu.edu
Office hours: Wednesday 1-2 PM

TA: Yong Wang, Email: ywang98@gwu.edu

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: Yong Wang Email: ywang98@gwu.edu

TA Office hours: 4:30-5:30 on Wednesday and 2:15-3:15 PM on Thursday, Location: Rome Hall 766.

COURSE DESCRITION

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 seven (biweekly) quizzes. The lowest two scores are dropped.

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 3 hours per week on direct instruction (class time) and 5 hours per week on independent learning (assignments, studying, and independent learning activities). Stat 51, 53, 91, 104, 111, and 127 are related in their subject matter, and credit for only one of the six may be applied toward a degree.

Course Policies:

- Regular class attendance.
- No late work is acceptable (unless for serious reasons with documentation).
- No make-up examinations (unless for serious reasons with documentation).
- The Blackboard System (http://blackboard.gwu.edu/) will be used for this course.

University policies:

University policy on observance of religious holidays

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. students.gwu.edu/accommodations-religious-holidays.

Academic integrity code

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.

Safety and security

- Monitor GW Alerts and Campus Advisories to Stay Informed before and during an emergency event or situation
- In an emergency: call GWPD/EMeRG 202-994-6111 or 911
- In the event of an armed Intruder: Run. Hide. Fight.

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. 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. counselingcenter.gwu.edu/

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 Ii 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

Tentative Schedule

Class	Date	Sections	Topics
1	W 1/17	Introduction: Class Syllabus, R Introduction	Chapter 1: What is Statistics? R Introduction
2	M 1/22	Chapter 2	Chapter 2: Sample Vs Statistic
3	W 1/24	Chapter 2: Data Exploration	Chapter 2: Methods for describing sets of data
4	M 1/29	Chapter 2 continued **Quiz #1**	Chapter 2: Measures of center and spread
5	W 1/31	Chapter 2 continued	Chapter 2: Detecting outliers using Box plots and z-Score, The Empirical Rule
6	M 2/5	Chapter 3: Probability	Chapter 3: Introduction to probability
7	W 2/7	Chapter 3 continued	Chapter 3: Conditional probability, Independence events
8	M 2/12	Chapter 4: Random Variables and Probability Distributions **Quiz #2**	Chapter4: Types of Random Variables, Probability Distributions for Discrete Random Variables
9	W 2/14	Chapter 4 continued	Chapter 4: Binomial Random Variables
	M 2/19	President's Day: No Class	
10	W 2/21	Chapter 4 continued	Chapter 4: Continuous Probability Distribution, Normal and Uniform
11	M 2/26	Chapter 5: Sampling Distribution **Quiz #3**	Chapter 5: Sampling Distribution
12	W 2/28	Chapter 5: Estimation	Chapter 5: Sampling Distribution Properties of Sampling Distributions The Central Limit Theorem
13	M 3/4	Chapter 6 continued	Chapter 6: Point Estimation Confidence Interval (CI) for the Population Mean
14	W 3/6	Chapter 6 continued **Quiz #4**	Chapter 6: Large Sample CI for Proportion Determining Sample Size

	3/11, 15	No Class – Spring Break	
15	M 3/18	Review for Midterm	
16	W 3/20	**MIDTERM**	
17	M 3/25	Midterm Recap **Project Introduction**	Chapter 7: Hypothesis Testing
18	W 3/27	Chapter 7: Hypothesis Testing	Chapter 7: Hypothesis Testing
19	M 4/1	Chapter 7 continued	Chapter 7: Hypothesis Testing for Means with Small Samples Hypothesis Testing for Proportions
20	W 4/3	Chapter 7: Statistical Inference	Chapter 7: Comparing Two Population Means
21	M 4/8	Chapter 7 continued **Quiz #5**	Chapter 7: Comparing Two Population Means Paired Difference Experiments
22	W 4/10	Chapter 7 continued	Chapter 7: Comparing Two Population Proportions Determining the Sample Size
23	M 4/15	Chapter 12: Analysis of Categorical Variables	Chapter 12: Categorical Data Analysis Multinomial Experiments Chi-Square Tests
24	W 4/17	Chapter 12 continued **Quiz #6**	Chapter 12: Chi-Square Tests (Two- Way Tables)
25	M 4/22	Chapter 11: Regression Analysis	Chapter 11: Simple Linear Regression
26	W 4/24	Chapter 11 continued **Projects Due**	Chapter 11: Model Assumptions Parameter Estimation
27	M 4/29	Chapter 11 continued **Quiz #7**	Chapter 11: Coefficients of Correlation and Determination Model Estimation and Prediction
28	W 5/1	Review for Final	

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).